Australian Government

Prime Minister's Task Group on Energy Efficiency

REPORT OF THE PRIME MINISTER'S TASK GROUP ON ENERGY EFFICIENCY

Australian Government

Prime Minister's Task Group on Energy Efficiency

REPORT OF THE PRIME MINISTER'S TASK GROUP ON ENERGY EFFICIENCY

CANBERRA
JULY 2010

Published by the Department of Climate Change and Energy Efficiency

www.climatechange.gov.au

ISBN 978-1-921299-06-3 (pdf)
978-1-921299-07-0 (rtf)
978-1-921299-08-7 (paperback)

Note: Unless otherwise stated, all dollar amounts are in Australian dollars.

Editorial consultant Wilton Hanford Hanover

Printed by Blue Star Aust Pty Limited

The cover of this report is printed on 9Lives 80, which contains 80% post-consumer fibre and 20% totally chlorine-free pulp, sourced from well-managed forests and controlled sources. It is manufactured by an ISO 14001 certified mill.

The inside pages are printed on ENVI, which is an Australian Government accredited carbon-neutral paper. ENVI is made in Australia from elemental chlorine-free pulp derived from sustainably managed forests. It is manufactured by an ISO 14001 certified mill.

Australian Government
Department of Climate Change
and Energy Efficiency

Martin Parkinson PSM
Secretary

The Hon Penny Wong
The Hon Martin Ferguson
Parliament House
CANBERRA ACT 2600

Dear Ministers

REPORT OF THE PRIME MINISTER'S TASK GROUP ON ENERGY EFFICIENCY

I am pleased to present to you the *Report of the Prime Minister's Task Group on Energy Efficiency*.

In preparing this report, the Task Group has been informed by the views of a wide range of stakeholders. We considered some 200 submissions from interested parties, most of which are available at www.climatechange.gov.au. We also had discussions with representative groups and individuals in Australia and overseas. The broad-ranging expertise of government, industry, energy and environmental organisations has been of significant benefit to the deliberations of the Task Group.

We hope that this report can contribute to the development of policy that will strengthen Australia's response to climate change and reduce pressure on the energy costs of all Australians. Our recommendations, in response to the terms of reference, have been framed to be economically and environmentally effective, and socially inclusive; to complement both a carbon price and the Renewable Energy Target; and to build on the National Strategy on Energy Efficiency.

On a personal note, I would like to thank you for the opportunity to chair the Task Group. I know my colleagues on the Task Group (Drew Clarke, Nigel Ray and Gordon de Brouwer) share my views on the value of being able to work alongside the private and non-government organisations in our Advisory Group (representatives from the energy market bodies, industry, the Energy Retailers Association, WWF-Australia, the Climate Institute, the Energy Efficiency Council, the Australian Council of Social Service and the Australian Council of Trade Unions). It has been a rewarding experience.

All of us would like to record our appreciation for the excellent support we have received from the Secretariat to the Task Group, ably led by Howard Bamsey.

Yours sincerely

Martin Parkinson

July 2010

CONTENTS

EXECUTIVE SUMMARY

'Only energy efficiency can generate nearly immediate results with existing technology and proven policies and do so while generating strong financial returns.'

UN Foundation Report 2007,
Realizing the potential of energy efficiency

The energy that drives our economy and underpins our wellbeing in everyday life is also the biggest single source of Australia's greenhouse gas emissions. Doing our part in the global response to climate change requires that we not only reduce the carbon intensity of our energy supply but also improve our energy efficiency. This will ensure Australians achieve the maximum benefit and emit the minimum greenhouse gases from the energy we consume.

Energy efficiency is Australia's untapped energy resource—a means to improve the productivity of the economy as well as an important element in moving towards a prosperous low-carbon future.

As many other countries have found, improving energy efficiency also delivers a range of other benefits. It can help reduce pressure on household budgets from increasing energy prices that result from burgeoning global demand for energy, it can vastly improve the level of comfort in our buildings (both homes and workplaces) and it can help business adjust to changing competitive pressures. Enhanced energy efficiency can improve energy security (providing greater confidence that global future needs can be satisfied) and, as noted above, form part of our response to climate change.

For these reasons, countries around the world are increasingly focusing on ways to improve the productivity and effectiveness of how they use energy. In the process they are seeking, and finding, competitive advantage for their firms in the global economy.

To date, Australia has not consciously or explicitly targeted world best practice in energy efficiency policy and, by comparison with other countries, has significant gaps in its energy efficiency policy armoury. While many countries are addressing both the energy efficiency 'floor' and the 'ceiling' — improving the minimum acceptable standard and extending the maximum — Australian measures have generally been focused on the floor alone.

Although both are difficult to measure with precision, it seems clear that the level and the rate of improvement of energy efficiency in Australia lag behind those of much of the rest of the world.

This report considers the case for a step change in Australia's energy efficiency performance. It provides a rationale for such an effort, reviews the barriers that will have to be dealt with and proposes mechanisms for moving forward.

Implementing a 'step change' to place Australia at the forefront of OECD energy efficiency improvement is not a simple task—Australians will need to make choices on investment in energy and its use, and it will require a sustained policy commitment to achieve.

This report canvasses five foundation measures that together would provide the basis for a step-change improvement in Australia's energy efficiency performance:

1. Setting an aspirational national energy efficiency target of improving our primary energy intensity by 30 per cent between now and 2020.
2. Establishing a transitional national energy savings initiative that would replace existing and planned state energy efficiency schemes and be phased down as a carbon price matures.
3. Resetting the governance framework of energy efficiency so that responsibility for its delivery, coordination and implementation is clear.
4. Providing a stronger enabling environment for energy efficiency innovation by improving information, data and analysis—noting that for something to be managed, it must be measured.
5. Building an energy efficiency culture in Australia through a long-term, nationally integrated strategy.

The cornerstone of the step change would be the proposed national energy savings initiative, which would set an obligation on energy suppliers to constrain demand among their customers. Harnessing the flexibility of the market, such a mechanism would create an incentive for energy suppliers to aggregate currently uneconomic energy efficiency opportunities in households and businesses so that they could be profitably exploited. The national and broad-based scope of the initiative would bring a coherence and consistency to energy efficiency efforts across Australia that has been missing until now. This would be expected to lower implementation and transaction costs. Experience from other countries, the early outcomes of the state schemes and preliminary analysis commissioned by the Task Group provide encouragement that further exploration of the concept would be worthwhile—designed well, such a scheme could reduce pressure on energy bills within a relatively short time.

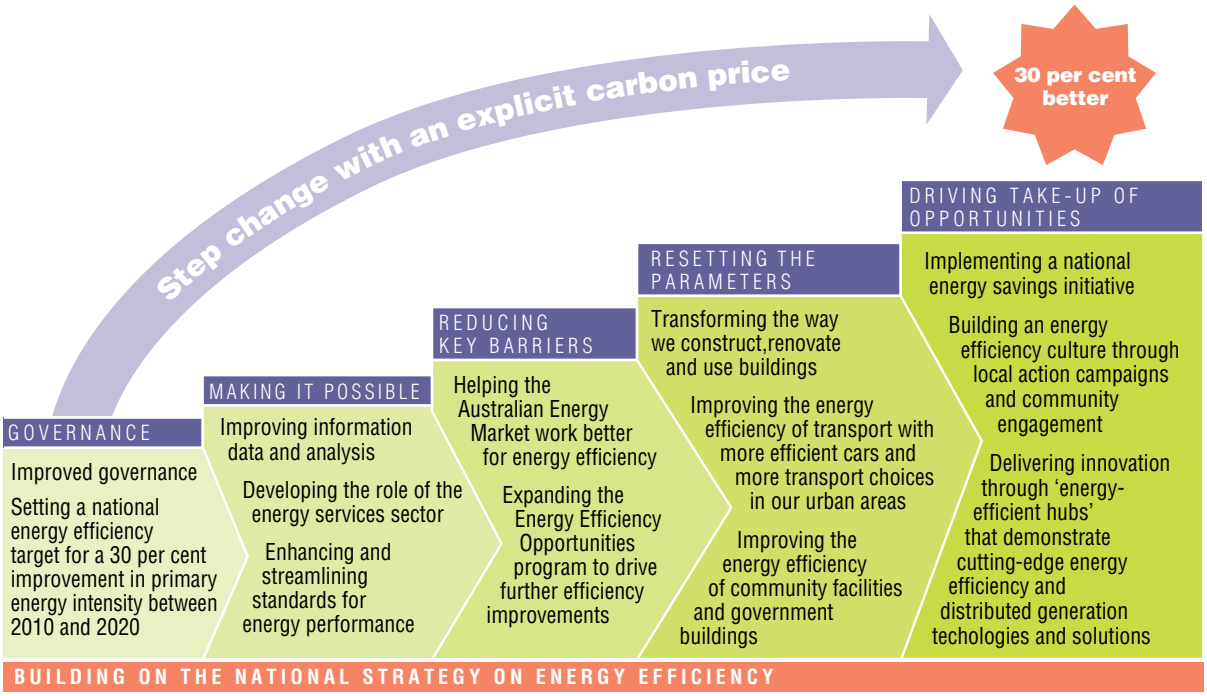
The emphasis in all of these proposed measures is on their national application. Commonwealth leadership is essential if the national dimension is to be achieved. But because the states and territories are, and will remain, active on energy efficiency, it is the Task Group's view that effective implementation of the foundation measures would require the full cooperation of all jurisdictions and extensive collaboration among them.

Beyond the five foundation measures, this report also canvasses a suite of sector-based proposals that would provide specific benefits in particular areas, but that on their own would not deliver a step-change improvement in Australia's energy efficiency. These are illustrated in Figure ES.1

Should the Government adopt a national energy savings initiative as proposed, some of the sector-specific measures could be forgone. The Task Group has, therefore, not specified full details, including costs, of proposed measures as these would vary depending on which ones were chosen from the menu and how broadly they were implemented.

Adoption of an energy savings initiative on the scale suggested here would also provide an opportunity for the consolidation and rationalisation of existing individual programs across all three levels of government—Commonwealth, state and local. To be fully effective this would require cooperation among jurisdictions, but the pay-off in terms of improved effectiveness and coherence of energy efficiency policy and reduced compliance costs for business seems well worth pursuing.

Figure ES.1 Key opportunities for a step-change improvement in Australia's energy efficiency



High-level recommendations

The series of energy efficiency proposals canvassed in this report are set within the context of comprehensive and timely implementation of the measures outlined in the National Strategy on Energy Efficiency and the introduction of an explicit carbon price—which will ultimately underpin and catalyse energy efficiency improvement throughout the economy.

The Task Group concludes that the Government, in order to deliver a step-change improvement in energy efficiency by 2020 and place Australia at the forefront of OECD energy efficiency improvement, should:

Recommendation 1:

Agree to an aspirational national energy efficiency target of improving our primary energy intensity by 30 per cent between now and 2020.

Recommendation 2:

Agree to the introduction of a transitional national energy savings initiative to replace existing and planned state energy efficiency schemes, subject to detailed consultation on its design.

Recommendation 3:

Agree to further work that will outline new national governance arrangements for COAG consideration later this year.

Recommendation 4:

Agree to improve the data, information and analysis tools necessary to enable energy efficiency innovation, to track the national target, and to underpin future policy development.

Recommendation 5:

Agree to the development and design of a long-term national strategy to build a culture of energy efficiency.

Recommendation 6:

Consider the suite of other sectoral proposals in Part 3 of the report that are aimed at addressing specific barriers to energy efficiency improvement in particular areas of the economy. Several sectoral proposals could usefully be progressed at low cost and without compromising later government decisions in relation to the recommended foundation measures:

- enhance the assessment and verification requirements and expand the coverage of the *Energy Efficiency Opportunities Act 2006* to include large energy generators and energy transmitters and distributors, and major greenfield and expansion projects (chapter 8)
- consider the introduction of a mandatory light vehicle CO_2 standard, a Commonwealth fleet emissions target and the development of interoperability standards for electric vehicles, as well as a clear government statement on electric vehicles as a part of our future vehicle mix and supporting global collaboration on improving vehicle fuel efficiency (chapter 9)
- reduce the barriers to energy efficiency in the Australian energy market (chapter 12)
- streamline and expand minimum energy performance standards and introduce high energy performance standards through the current national legislation process (chapter 14).

Foundation measures recommended

- A national energy efficiency target
- A national energy savings initiative
- An improved governance structure
- Improved innovation, data and analysis
- A long-term strategy to build a culture of energy efficiency

Supporting options

Large energy users

- Consider expanding the Energy Efficiency Opportunities program.*
- Consider introducing a large energy users demonstration incentive.

Transport

- Consider supporting the Global Fuel Economy Initiative's '50 by 50' campaign, a global project to make cars 50 per cent more fuel efficient than 2005 levels by 2050.*
- Consider introducing mandatory CO_2 standards for light vehicles.*
- Consider setting an emissions target for the Commonwealth vehicle fleet; encouraging states and territories without targets to join a Commonwealth target if one was implemented; setting an ambitious but achievable definition of an environmentally friendly Australian-made car and linking this definition to the provision of funding under the Green Car Innovation Fund.*
- Consider implementing recommendation 9b of the review of Australia's future tax system on reforming the treatment of vehicles under fringe benefits tax.
- Investigate enhancements to existing vehicle labelling, additional promotion of the existing Green Vehicle Guide and the feasibility and desirability of expanding some form of labelling to second hand cars sold through dealerships.
- Consider facilitating trials to evaluate low-emissions, energy-efficient technologies for commercial vehicles.

Note: An asterisk * denotes options that could be usefully progressed at low cost without compromising later decisions on the foundation measures.

- Continue to monitor the development and implementation of international heavy vehicle standards with a view to their introduction when determination of emissions performance is feasible.
- Consider explicitly linking Commonwealth transport infrastructure funding to energy efficiency outcomes.
- Consider requiring Infrastructure Australia to assess all proposals for funding of transport projects not just those made through the Building Australia Fund.
- Move towards best practice transport and infrastructure appraisal processes including consistent and up-to-date estimates of variables and increasing transparency in transport infrastructure appraisal processes.
- Encourage states and territories to implement recommendation 61 from the review of Australia's future tax system on congestion pricing.
- Consider implementing a 'Smart City' transport initiative as a priority investment area for public and active transport.
- Consider supporting Standards Australia to undertake a costed work program for electric vehicle standards.*
- Consider making a clear announcement that, conditional on the decarbonisation of the Australian electricity supply proceeding as forecast or the availability of renewable energy to charge vehicles, Australia sees electric vehicles as a potential part of our future vehicle mix.*
- Where they retain these measures, encourage states and territories to consider revising both stamp duty and registration for new light vehicles to establish differential charges linked to environmental performance.

Buildings

- Consider the development of a pathway towards zero-emissions buildings.
- Consider strengthening Australia's capacity to assess building energy use.

Delivering innovation — energy-efficient hubs

Consider investing in trials of:

- Industrial hubs that could demonstrate energy synergies (and energy efficiency/distributed generation technologies) in regional network constrained areas and, manufacturing and mining activities.
- Net zero-emissions urban hubs that could showcase new high-technology and low-emissions residential buildings and precincts.
- Central business district hubs that could trial retrofits for highly energy-efficient commercial buildings and district-scale energy solutions.

Energy markets*

- Consider removing the exemption for generators in the *Energy Efficiency Opportunities Act 2006* to ensure that they identify possible cost-effective energy efficiency improvements.
- Consider the inclusion of electricity and gas transmission and distribution networks in the Energy Efficiency Opportunities Act, and require that they identify measures to reduce losses in the networks where the benefits to the market of doing so clearly outweigh the costs.

Note: An asterisk * denotes options that could be usefully progressed at low cost without compromising later decisions on the foundation measures.

- Consider tasking the Australian Energy Market Commission/Australian Energy Regulator to provide stronger regulatory oversight of the regulatory investment test process.
- Consider requiring the Australian Energy Regulator to review the effectiveness of the Demand Management Incentive Scheme measures (building on previous improvements in this area).
- Consider the acceleration and expansion of the current Ministerial Council on Energy work to streamline distributed generation connection processes.
- Encourage more efficient, cost-reflective price signals in energy markets, including time-of-use pricing where appropriate.
- Consider tasking the Ministerial Council on Energy to incorporate any national energy efficiency target into National Electricity Market governance arrangements.
- Consider requiring the Australian Energy Regulator to undertake a regular energy efficiency performance review of relevant National Electricity Market participants which would allow for monitoring of improvements over time.
- Consider tasking the Australian Electricity Market Commission to consider any supporting changes in the National Electricity Rules in the context of this package of options.

Role of energy services companies

- Consider a revolving financing mechanism to support building energy efficiency improvements across community facilities.
- Consider setting new targets for government buildings (leased or owned) and establishing a revolving building fund for Commonwealth government portfolios to bid for retrofit upgrades.
- Consider working with relevant industry associations, education and training service providers and other stakeholders to develop and promote an accreditation and training regime for energy service companies.

Energy efficiency standards, ratings and labels*

- Consider enhancing the current greenhouse and energy minimum standards (GEMS) legislative development process to streamline, accelerate and widen minimum energy performance standards (MEPS), and introduce high energy performance standards (HEPS).
- Consider developing standards for priority systems
- Consider developing an endorsement label for HEPS.
- Consider mandating the procurement of HEPS-rated products for Australian government operations and encourage jurisdictions to do the same.
- Consider introducing mandatory disclosure of the energy efficiency of a range of products and services in advertising and promotional material.

Note: An asterisk * denotes options that could be usefully progressed at low cost without compromising later decisions on the foundation measures.

On 30 March 2010, the Prime Minister announced the terms of reference and membership for a Task Group on Energy Efficiency. The Task Group was asked to report on the most economically and environmentally effective mechanisms to deliver a step change in Australia's energy efficiency performance, placing Australia at the forefront of OECD improvement in energy efficiency performance by 2020.

The Task Group comprised the Secretary of the Department of Climate Change and Energy Efficiency (Chair), with Deputy Secretaries from the Department of the Prime Minister and Cabinet and the Treasury, and the then Deputy Secretary, later Secretary, of the Department of Resources, Energy and Tourism. The Task Group was supported by a small inter-agency secretariat located within the Department of Climate Change and Energy Efficiency.

The Task Group was assisted by an Advisory Group comprising representatives from the energy market bodies, industry, the Energy Retailers Association, the Climate Institute, WWF-Australia, the Energy Efficiency Council, the Australian Council of Trade Unions, and the Australian Council of Social Service. Brief biographical details of Task Group and Advisory Group members are at Appendix B.

At the end of March 2010, the Task Group released an issues paper that invited public submissions on key issues relevant to the terms of reference. Almost 200 submissions were received from individuals and organisations. The Task Group also undertook extensive consultations with key stakeholders and institutions, including a series of national workshops and a four-week online discussion forum. Discussions were also held with relevant experts and policy-makers in France, New Zealand, the United Kingdom and the United States.

The Task Group is grateful for the time, effort and thought invested by stakeholders in participating in the national workshops, preparing submissions and engaging with detailed consultations. These have helped inform the views set out in this report.

Structure of this report

Following an executive summary, which contains the Task Group's recommendations — the 'foundation measures'—is a summary of other proposals in the report.

Part 1 of the report places Australia's action on energy efficiency in context. Chapter 1 discusses the importance of energy efficiency and the rationale for

improving it. Chapter 2 compares Australia's performance to that of other countries, and discusses the barriers to improving Australia's performance, as well as energy efficiency measures implemented to date. The chapter also outlines the concept and scale of a step change in energy efficiency performance.

Part 2 of the report outlines five recommended foundation measures for delivering a step change: a national aspirational energy efficiency target (chapter 3); a national energy savings initiative to replace existing and planned state schemes (chapter 4); new energy efficiency governance arrangements (chapter 5); a proposal to encourage innovation and to better measure and analyse Australia's energy efficiency performance in the future (chapter 6); and a national strategy to build a culture of energy efficiency (chapter 7).

Part 3 (chapters 8 to 15) describes a suite of options that could help to address barriers identified in specific sectors of the economy. While these options are not developed in full detail, this group of chapters provides proposals that would benefit from careful consideration by government of the contribution they could make to improving Australian energy efficiency performance over the decade ahead.

The appendices contain the Task Group's terms of reference, along with its composition and that of the Advisory Group, and a list of the organisations and individuals who made submissions to the Task Group. The submissions can be accessed on the website of the Department of Climate Change and Energy Efficiency. Other appendices contain in-depth discussion of, or additional information on, some of the issues raised in the report.

To aid readers, there is a list of boxes, figures and tables on page 251, a list of abbreviations and acronyms on page 255, a glossary on page 257, and a consolidated list of references on page 265.

Energy efficiency in context

What is energy efficiency and why is it important?

Energy touches every aspect of Australian life. It drives our economy, keeps our homes comfortable, gets us from place to place, delivers goods and services, and is exported to the world. Improving the efficiency with which we use energy will deliver benefits to every corner of the country.

Improving energy efficiency will help reduce Australia's greenhouse gas emissions and improve the economic competitiveness of Australian firms. It will bring benefits to the community through better health and lower energy bills and it will help keep energy supplies secure for the future.

This chapter explores these benefits in detail, placing energy efficiency in the broader context of responding to climate change, maintaining our productivity, helping the most vulnerable in our community and securing our future prosperity.

This chapter also analyses several concepts that are important to the rest of the report. These include:

- Australia's 2020 emissions reduction targets
- energy efficiency policy in the broader climate change policy context
- factors that affect energy price rises
- estimating the cost of improving energy efficiency
- benefits to individuals, communities and society as a whole from improving energy efficiency
- principles for developing cost-effective energy efficiency policy.

Energy is integral to the way our society operates and the way we live our daily lives. It powers our businesses, schools, hospitals, shops and homes. It supports our comfort and contributes to our safety, facilitates our education and enables our travel.

A rising demand for energy has been a hallmark of industrialisation and economic development. Not surprisingly, world electricity demand is projected to continue to increase, driven by economic and population growth and rising living standards. Energy consumption in Australia is also projected to grow strongly, rising 14 per cent between 2010 and 2020[1] — in the electricity sector alone, this means adding the capacity of a small country's annual energy consumption within the next decade (for example, the total energy consumption of New Zealand in 2007).

The rise in our living standards on the back of higher energy use will continue — at home and abroad. But this will bring with it new challenges. The rapid and welcome development of the emerging economies is contributing to a burgeoning global demand for energy that will continue to increase prices, yet billions of the world's population still lack access to modern energy services.[2] At home, the combination of rising world demand, rapid Australian growth and large investment needs (due to ageing infrastructure) is putting pressure on energy prices.

Overlaid on this is the challenge of climate change. The energy that drives our economy and everyday lives is also the biggest single source of Australia's greenhouse gas emissions.

Responding to climate change while delivering a stable and growing energy supply requires that we both reduce the carbon intensity of the energy produced and improve the efficiency with which energy is used. Together, these actions will achieve maximum social benefits with minimum carbon emissions.

While the introduction of an explicit price on carbon is the only way we can be confident of reducing greenhouse gas emissions at least cost, the carbon price needs to be supported by other complementary policies.

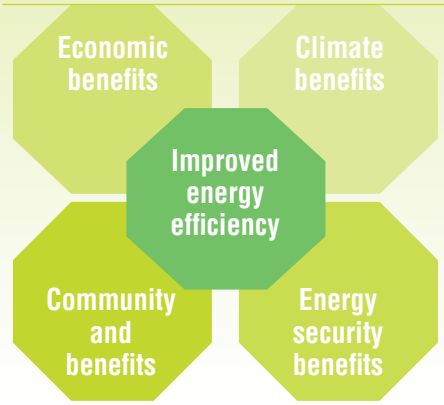
Australia has adopted a revised renewable energy target that will increase the amount of energy produced from renewable sources by four times between now and 2020, resulting in 20 per cent of total electricity supply coming from renewables. But we also need to move dramatically to improve energy efficiency.

Given that energy is vital to the functioning and wellbeing of our economy and our society, optimising and improving the efficient use of energy could deliver economic and social benefits, improve the security of supply and, most importantly, help reduce Australia's greenhouse gas emissions and achieve our bipartisan 2020 emissions reduction target.

There are four complementary rationales for enhancing Australia's energy efficiency effort, as shown in Figure 1.1:

- climate benefits
- economic benefits
- community and social benefits
- energy security benefits.

Figure 1.1 Benefits of energy efficiency



In the sections below, we examine each of these rationales in turn. As noted in the World Economic Forum's *Energy vision update 2010,* the picture that emerges is one of energy efficiency as 'an answer to multiple questions'.[3]

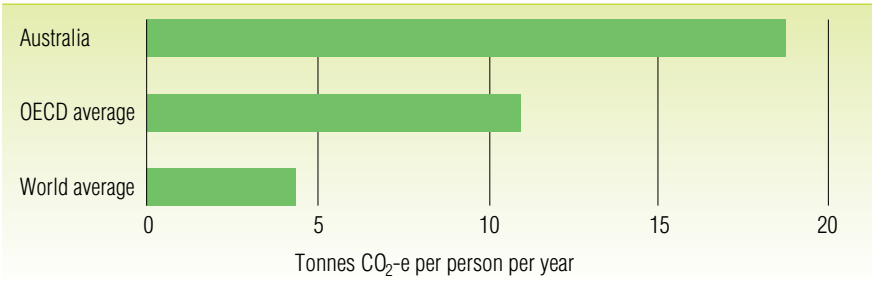
Improving energy efficiency is one of the fastest and most cost-effective ways of reducing our greenhouse gas emissions.

Climate benefits

Energy efficiency is closely aligned with climate policy. Climate change and its consequences for economies and communities is one of the most pressing challenges of our time. Australia has committed to reducing its carbon pollution by up to 25 per cent below 2000 levels by 2020 (see Box 1.1).

Australia has one of the most carbon-intensive economies in the world. Because of our carbon-intensive energy sector, and our specialisation in energy-intensive economic activity, our emissions per person from energy use are much higher than the world and developed country averages (see Figure 1.2). With over 60 per cent of Australia's greenhouse gas emissions coming from energy use,[4] improving the efficiency of energy and fuel use will be important now and into the future.

Figure 1.2 Per capita emissions due to energy use, 2007



Source: IEA, *CO_2 emissions from fuel combustion*, 2009.

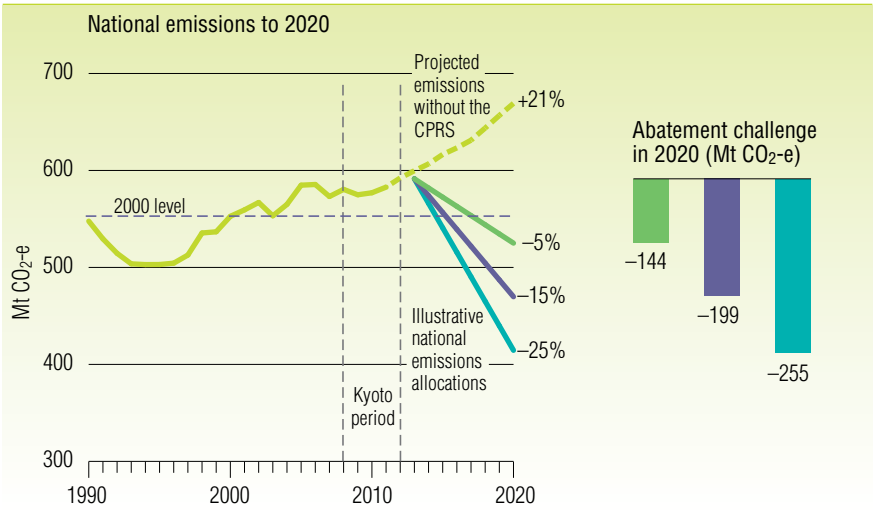
It is well recognised that improving energy efficiency is potentially one of the fastest and most cost-effective ways of reducing our greenhouse gas emissions and meeting our 2020 emissions reduction target.[5] In some cases, the value of energy savings over time can outweigh the upfront cost of investing in improved energy efficiency, leading to greenhouse gas emissions reductions that have a negative net cost — that is, they deliver financial rewards to the nation that exceed the upfront costs while also reducing emissions.

Box 1.1 Australia's 2020 emissions reduction target

The Government has committed to reducing Australia's carbon pollution to 25 per cent below 2000 levels by 2020 if the world agrees to a global deal to stabilise levels of greenhouse gases in the atmosphere at 450 parts per million (ppm) of carbon dioxide equivalent (CO_2-e) or lower. If the world is unable to reach agreement on a 450 ppm target, Australia will still reduce its emissions by between 5 and 15 per cent below 2000 levels by 2020. These targets have bipartisan endorsement.

Meeting Australia's 2020 emissions reduction target will be challenging. Australia's emissions profile has considerable momentum — on a 'business as usual' pathway, our emissions would rise to 121 per cent of 2000 levels by 2020. As shown in Figure 1.3, Australia's 'abatement challenge' is around 140 million tonnes (Mt) CO_2-e below business as usual in 2020 under the –5 per cent target (a 26 percentage point reduction), while under the –25 per cent target option the abatement challenge is around 250 Mt CO_2-e below business as usual (a 46 percentage point reduction).

Figure 1.3 Australia's abatement task



Note: Illustrative national emissions allocations shown assume that a Carbon Pollution Reduction Scheme cap starts from 2012–13, following a fixed-price year (without a cap).

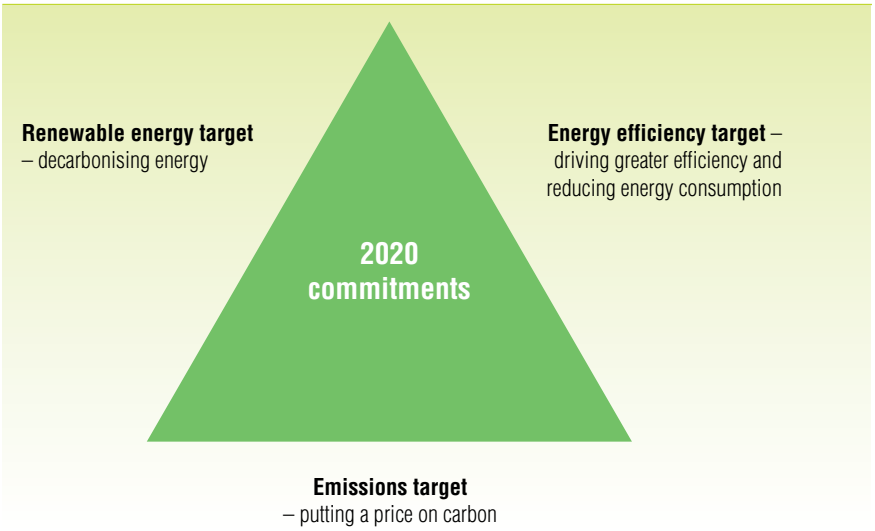
Source: Department of Climate Change, *Australia's fifth national communication on climate change*, report under the United National Framework Convention on Climate Change, 2010.

Together stationary energy use and transport account for 65 per cent of Australia's emissions.[6] Australia must rapidly decarbonise its energy supply so that the economy can continue to grow without a corresponding increase in our greenhouse gas emissions. This is referred to as 'decoupling' economic growth from emissions growth. Cost-effective energy efficiency can speed up this transformation and reduce the adjustment costs.

The Renewable Energy Target (RET) and other clean energy initiatives will help to decarbonise the stationary energy sector by increasing the amount of renewable energy in the electricity supply. Improvements to energy efficiency would also slow the growth in energy use, effectively reducing the carbon intensity of the economy even further.

Figure 1.4 depicts how specific energy efficiency measures work together with a carbon price, and with existing policy measures such as the RET, to ensure that Australia meets its 2020 emissions reduction target.

Figure 1.4 Energy efficiency: a key part of reducing our emissions from energy use



One of the fastest, easiest and cheapest ways to make our economy stronger and cleaner is to make our economy more energy efficient.

US President Barack Obama[7]

The introduction of a broad-based carbon price is the only practical way that Australia can guarantee that its greenhouse gas emissions will stop growing and begin to decrease. Specific cost-effective energy efficiency measures, targeted at known energy efficiency barriers (see section 2.3), may be highly complementary to other key strategies for greenhouse gas abatement. Improving energy efficiency offers the prospect of less exposure to a future carbon price and, particularly while renewable energies remain more expensive than their fossil fuel alternatives, it makes economic sense to use these more expensive energy sources as efficiently as possible.

1.1 Economic benefits: energy efficiency as a resource

Energy resources are important sources of economic wealth, and our continent is particularly resource rich. We have capitalised on that advantage by establishing world-leading skills in finding, developing, transforming and marketing energy resources. Our current approach is focused on energy supply — however, energy efficiency is also an important energy resource. Australia's ability to focus increasingly on managing domestic demand — the 'how and when' of energy use — will help in minimising the cost of energy infrastructure and the price of delivered energy.

Australia's use of energy is growing rapidly, and using energy more efficiently can help restrain costs. Total demand for energy is projected to continue to increase with growth in Australia's economy and population — rising 14 per cent over the next decade[8] — and peak energy demand is growing even faster.[9] This energy growth will require substantial investment to maintain and update Australia's electricity infrastructure (with more than $42 billion of investment either approved or proposed over the next five years).[10] Financing this investment is already having an impact on electricity prices and will continue to do so (see Box 1.2). The eventual introduction of an explicit carbon price will also add to future energy prices. Improvements in energy efficiency will reduce infrastructure and fuel costs and will help reduce pressure on the energy bills of Australian businesses and households, now and into the future.

Box 1.2 Factors influencing electricity price rises

Residential electricity prices are made up of a number of different components, including wholesale electricity costs, transmission and distribution network costs (including metering), retail costs (including retailers' margins) and other costs associated with specific government policies, including climate change policies.

Figure 1.5 provides an indicative breakdown of the major components of electricity prices currently faced by residential consumers across Australia.

Electricity prices are expected to continue to rise over the next few years, primarily as a result of increased investment in network infrastructure. However, wholesale electricity prices are also expected to continue to rise as a result of tighter demand and supply conditions. Compliance costs for Commonwealth and state-based schemes, such as the Renewable Energy Target, the Queensland Gas Scheme, and the NSW and ACT Greenhouse Gas Reduction Scheme, plus the various white certificate schemes (see section 4.2), also affect retail electricity prices, as will the introduction of a price on carbon.

Distribution and transmission network charges (which are regulated by the Australian Energy Regulator in the National Electricity Market) are currently the major drivers of rising electricity prices; this is primarily due to higher peak demand and ageing assets.[11]

In its most recent retail electricity price determination, the NSW Independent Pricing and Regulatory Tribunal outlined increases in retail electricity prices for residential consumers of between 20 and 42 per cent (depending on the retailer) over three years from 1 July 2010.[12] Rising network charges is the main driver behind these price rises, accounting for price rises of between 16 and 35 per cent (depending on the retailer) over the three years.[13] Increases in wholesale energy costs and retail costs and margins account for the remainder.

The Queensland Competition Authority has determined that residential electricity prices will rise by 13 per cent over the three years from 1 July 2010. Nearly two-thirds of this price increase is due to increased network costs.[14]

Significant recent price increases in Western Australia are largely a reflection of past state government decisions to restrain retail electricity prices, but they also reflect rising network costs.[15]

Figure 1.5 Indicative components of residential electricity prices

Source: Task Group calculation based on the breakdown of state/territory components of residential electricity prices using a two-year average of previous state/territory price determinations for 2008–09 and estimated price determinations for 2009–10, weighted across Australia by population size.

In both electrical and transport infrastructure, the true cost of using the network depends on the time of day and the location of the user. At present, pricing systems do not encourage users to take their demands on the network and other users into account. On the roads, this results in congestion and suboptimal investment in road infrastructure, with associated effects on urban form and amenity. In electricity markets, it results in earlier investment in new generation and transmission capacity, which could have been avoided or deferred if all users faced prices that reflected the full costs of their use.[16]

In both transport and electricity networks, efficient pricing (time- and location-dependent congestion pricing for major cities and time-dependent electricity tariffs) could improve efficiency by ensuring that prices reflect the full value of production and network costs. An important implication of this is that, even if energy were completely decarbonised, there would still be a potential role for government policy to improve the efficiency of the electricity and transport networks. Indeed, California and other jurisdictions with a long history of energy efficiency policies used the possibility of avoiding or deferring generation capacity as one of the policy rationales for energy efficiency long before climate change was widely recognised as a major environmental problem.

In the longer term, improving energy efficiency also provides one strategy to maintain the competitiveness of Australian firms by better positioning our exporters in global markets. Global action to reduce greenhouse gas emissions will accentuate competitive advantages for low-carbon products while raising new challenges for high-carbon ones.

1.2 Community and social benefits

Energy efficiency can also generate community and social benefits. For example, retrofitting and weatherproofing cold and damp homes can improve people's health, reducing absenteeism from jobs and school, and reducing health system costs. Better insulated houses can also reduce heat stress in summer — a major concern for older Australians and those with health problems — and improve the affordability of energy services like heating and cooling.

Researchers at the University of Tasmania recently undertook an international literature review for the Tasmanian Government. They concluded:

> Householders in Australia, New Zealand, the UK, USA and Canada face serious health risks when living in inadequate housing and in conditions characterized by cold, damp, mould and a lack of natural light … [Many international studies] have tracked energy efficiency programs of various kinds and have found that improving the condition of domestic dwellings will create a context for more comfortable, healthy and financially affordable living. In addition to the benefits to individual householders, improving low income housing has both direct and indirect implications for the householders' communities, society, environment and the wider economy.[17]

In Australia, those on lower incomes generally spend a greater proportion of their household budget on energy bills.[18] They may find it difficult to fund energy efficiency improvements in their homes. Tenants may also find it difficult to convince their landlords to make such improvements. Energy efficiency measures, whether government funded or supported by an energy efficiency market mechanism, may be of particular benefit to low-income or other groups in society who might find energy efficiency actions difficult to undertake or access despite the personal and social benefits from doing so. This will become more important given the increasing pressure on energy prices.

Improved transport energy efficiency could also reduce local air pollution and improve urban amenity. Where, for example, better public transport is promoted for transport energy efficiency reasons, it is also likely to improve access to essential services for low-income households, as well as provide a range of social, health and psychological benefits through improved mobility.

1.3 Energy security benefits

Energy security is about ensuring that Australians have access to adequate, reliable and affordable energy supplies, both now and in the future. Since energy is critical to the economy and the normal functioning of society, the risks associated with inadequate energy security are substantial.

Australia has large reserves of fossil fuel resources, such as coal and gas. These, along with Australia's growing renewable energy sector, are capable of meeting both domestic demand for stationary energy and increased export demand over the coming decade.

However, our petroleum supplies are limited and Australia is becoming increasingly reliant on imports for transport fuels. Oil prices are generally expected to remain high, especially as the global economy recovers from recession.[19] Improving the fuel efficiency of our vehicle fleet and of the wider transport system would help to reduce Australia's reliance on imported transport fuels and improve our energy security (though measures other than energy efficiency will also be required).

Reliable and secure energy supply needs reliable energy infrastructure. The reliability of energy supply (avoiding blackouts and similar problems) is becoming ever more important to our economic wellbeing, as businesses and households are increasingly reliant upon technology that is highly sensitive to power quality and reliability, such as computers and the internet. As noted above, energy demand in Australia continues to grow rapidly, requiring a major expansion in our energy infrastructure — particularly electricity generation and transmission — over the next two decades.

New infrastructure comes at a price, as noted in Box 1.2. Improved energy efficiency can help manage the costs associated with new infrastructure by delaying or deferring the need for new investment. As discussed in chapters 11 and 12, energy efficiency and distributed generation can also play a role in increasing the security, stability and cost-effectiveness of energy markets.

Box 1.3 Estimating the cost of achieving improvements in energy efficiency

Any household, business or industry sector has a range of options for improving energy efficiency, which involve different actions, financial outlays and other returns. These different options also provide different amounts of energy savings and have different abilities to reduce the greenhouse gas emissions associated with energy use.

Analysis frequently arranges these options as a 'marginal cost curve'. Possible actions are ordered, left to right, from the lowest to highest incremental ('marginal') cost. If the estimates are presented in terms of greenhouse gas emissions saved, the cost curves are called 'marginal abatement cost curves'.

When interpreted properly, high-quality marginal abatement cost (MAC) curves provide useful information about the potential for energy efficiency improvements to save money and reduce emissions. Abatement cost curves, such as those in the recent ClimateWorks Australia report, *Low carbon growth plan for Australia*,[20] present the average expected emissions reduction in a given year for a range of different actions, coupled with the net cost of each action.

For energy efficiency improvements, the net cost on a MAC curve is often negative. Energy efficiency improvements result in households or businesses using less energy to achieve the same outcome. Where the improvement involves an upfront capital investment, the savings from lower energy bills may eventually offset any higher upfront costs. Such energy efficiency improvements typically feature as 'negative cost' opportunities on MAC curves. For example, negative cost opportunities to reduce emissions in the ClimateWorks report are mainly energy efficiency improvements in buildings, industry and transport.

However, as the ClimateWorks report points out, the cost curve methodology does not take into account the transaction and program costs associated with taking up any of the opportunities.[21] That is, estimated costs exclude the costs of government programs that might drive take-up of the opportunities, and 'opportunity costs' of achieving the outcomes. For example, they do not include the 'cost' to a business of senior management time and attention. The report also does not consider the non-financial costs involved in achieving energy efficiency improvements. For these reasons, net cost estimates in MAC curves are generally underestimates of the costs of actually realising the opportunities presented.

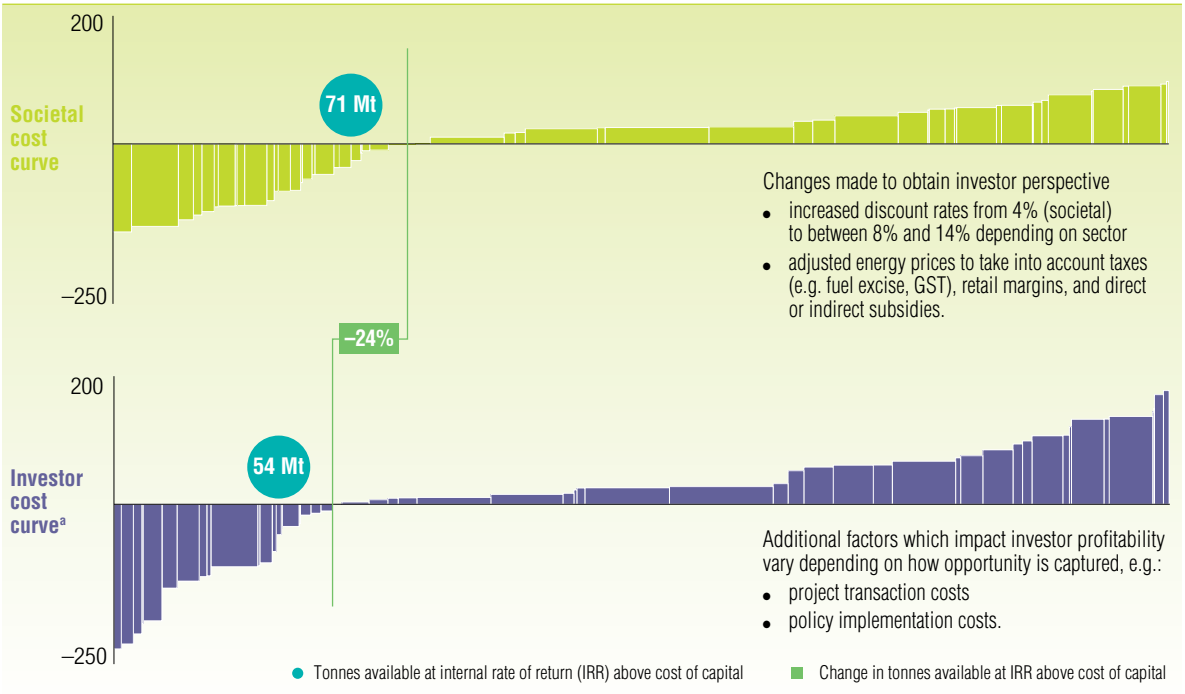
Many MAC curves use estimates of the cost of capital close to long-term government borrowing rates, and exclude taxes and transfers which net out at an economy-wide level. These societal cost curves are useful because they give policy-makers an idea of the costs to society as a whole of different actions to reduce emissions.

Moving from a societal to a private cost of capital and adjusting prices for energy taxes, retail margins and relevant subsidies produces an investor cost curve (see Figure 1.6). This curve is useful for indicating whether an opportunity is potentially profitable for the person who would undertake it; moving from a societal to an investor cost curve for Australia reduces the volume of negative-cost emissions reductions available in 2020 by around one-quarter.

However, even after adjusting for higher capital costs, the investor curve in Figure 1.6 still shows opportunities that are currently profitable for households and businesses which are not yet being widely implemented. Reasons for this are discussed in chapter 2.

Overall, high-quality MAC curves indicate that there is a role for well-targeted policies to realise low-cost energy efficiency improvements in cases where these are unlikely to be motivated by a broad-based carbon price alone.

Figure 1.6 Moving from a societal to an investor cost curve



a. Does not include the impact of a carbon price.

Source: ClimateWorks Australia, *A low carbon growth plan for Australia*, p. 17 (derived from 2020 greenhouse gas emissions reduction cost curve).

1.4 Costs and complementarity

Cost-effective improvements in energy efficiency will increase the productive capacity of the economy, improve our ability to respond to climate change and enhance wellbeing. In contrast, improvements in energy efficiency that impose higher costs to implement than the benefits from the reduction in energy use will lead to an overall reduction in productivity and wellbeing.

To help ensure that government action improves wellbeing, the Task Group has developed a set of principles for cost-effective energy efficiency interventions. In addition to the requirement for policy to address barriers to energy efficiency, and be complementary or assist the transition to an explicit carbon price (see Box 1.4), the following principles should be used in designing energy efficiency policy, to ensure that policies provide benefits to society that outweigh the costs.

Measures should:

- directly target the issue that needs to be addressed (for example, economy-wide market failures suggest an economy-wide policy response)
- be simple to understand and easy to access
- be part of a national, coordinated framework that avoids duplication, with responsibilities allocated to the level of government best placed to deliver the policy
- be fair and equitable across income groups and economic sectors, in both impacts and benefits
- minimise the level of risk or uncertainty faced by individuals, businesses and governments, and allocate risk to those best placed to manage it, while maintaining the freedoms that people currently enjoy
- maximise use of existing mechanisms and processes to avoid unnecessary costs of adjustment
- be flexible enough to allow new technologies and solutions to develop (measures should be broad based and technology/provider neutral wherever possible).

Box 1.4 Ensuring that energy efficiency measures complement a carbon price

A price on carbon is required to reduce Australia's greenhouse gas emissions. Introducing a carbon price also introduces the concept of 'complementarity'. A policy measure (whether in energy efficiency or another area) is deemed to complement a carbon price if (1) it is targeted at a market failure that will not be affected by a carbon price or that impinges on the carbon price's effectiveness, and (2) it does not actively hinder the effectiveness of a carbon price.

Many of the known barriers to energy efficiency (not all of which are market failures — see chapter 2) are generally considered to be little influenced by the presence of a carbon price,[22] and in some cases they actively prevent a carbon price from being effective in inducing action.

However, it does not follow that every measures designed to target these barriers will, prima facie, be complementary. Each new measure still requires assessment against principles of complementarity. The Council of Australian Governments agreed on a set of principles to guide Commonwealth, state and territory governments' assessment of existing and new measures for complementarity. These are appended to the Task Group's terms of reference (see Attachment B to Appendix A).

The proposals in this report are considered by the Task Group to either assist Australia's transition to a mature carbon price or to complement a carbon price— the primary drivers of the proposals identified are to address non-price barriers to energy efficiency that may still be present even with a carbon price in place.

Current Australian Government energy efficiency measures are expected to deliver more than 38 million tonnes of abatement in 2020.[23] Even with these measures in place, there remains substantial potential to improve energy efficiency and reduce greenhouse gas emissions cost effectively in Australia.

The International Energy Agency estimates that over half of the global energy-related emissions reduction required to meet a 450 ppm target would be expected to come from energy efficiency, given an underlying carbon price of US$50 per tonne of CO_2-e in 2020 and US$110 per tonne of CO_2-e in 2030.[24]

Research by the Bureau of Agricultural and Resource Economics (ABARE) estimated that energy efficiency could account for around 55 per cent of Australian emissions abatement to 2050.[25] Analysis by ClimateWorks Australia has also found that many of the most cost-effective forms of abatement are through improved energy efficiency.[26] The ABARE and ClimateWorks analyses also show that a carbon price is essential to delivering the full potential of energy efficiency.[27]

By far the most important element in a vision of a step change in Australia's energy efficiency improvement is the presence of an explicit price on carbon. An explicit carbon price will underpin and catalyse energy efficiency throughout the economy — greatly enhancing the effectiveness of proposals in this report. Energy efficiency policy is an important part of a suite of responses to climate change, but it cannot realistically be expected to do the 'heavy lifting' needed to deliver Australia's greenhouse gas reduction targets.

Notes

1 Unpublished data underlying *Australia's fifth national communication on climate change*.

2 United Nations Development Programme, *Energy services for the Millennium Development Goals*, 2005, pp. 1–2.

3 World Economic Forum, *Energy vision update 2010: Towards a more energy efficient world*, 2010, p. 8.

4 Australia's National Greenhouse Gas Inventory, www.ageis.greenhouse.gov.au/NGGI.aspx.

5 See, for example, N Stern, *The economics of climate change: The Stern Review*, Cambridge University Press, Cambridge, 2007; and R Garnaut, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008.

6 Australia's National Greenhouse Gas Inventory.

7 Remarks by President Barack Obama at the launch of the *Building energy efficiency initiative*, www.energy.gov/news/7550.htm, accessed 7 June 2010.

8 Unpublished data underlying *Australia's fifth national communication on climate change*.

9 Australian Energy Market Operator, *Electricity statement of opportunities*, 2009, pp. 3–22.

10 Summary of determinations published by the Australian Energy Regulator, quoted by The Hon Martin Ferguson, AM, MP, 'Energy prices will keep rising', *The Australian*, 22 March 2010.

11 Australian Energy Regulator, *New South Wales distribution determination, 2009–10 to 2013–14*, 2009.

12 Independent Pricing and Regulatory Tribunal (IPART) of New South Wales, *Review of regulated retail tariffs and charges for electricity: 2010–2013*, 2010, p. 1.

13 IPART, p. 13.

14 Queensland Competition Authority, *Final decision benchmark retail cost index for electricity: 2010–11*, 2010.

15 Office of Energy, Government of Western Australia, www.energy.wa.gov.au/2/3263/64/electricity_tar.pm, accessed 29 June 2010.

16 Distributed generation faces some similar problems. By siting a generator near a load, the amount of energy required to be imported from the network is reduced, so distributed generation could potentially defer augmentation of the transmission and distribution networks and large-scale generation.

17 C Elliott & E Stratford, *Energy efficiency measures in low income housing: Sub-project 1: Literature review,* University of Tasmania, March 2009.

18 S Hatfield-Dodds & R Denniss, *Energy affordability, living standards and emissions trading: Assessing the social impacts of achieving deep cuts in Australian greenhouse emissions. Report to The Climate Institute*, CSIRO Sustainable Ecosystems, Canberra, 2008.

19 International Energy Agency (IEA), *World energy outlook: Executive summary*, 2009, p. 6.

20 ClimateWorks Australia, *A low carbon growth plan for Australia*, 2010, p. 22.

21 ClimateWorks, p. 12.

22 See, for example, Stern; Garnaut.

23 Department of Climate Change, *Australia's fifth national communication on climate change*, report under the United Nations Framework Convention on Climate Change, 2010.

24 IEA, p. 8.

25 A Gurney, M Ford, K Low, C Tulloh, G Jakeman & D Gunasekera, *Technology: Toward a low emissions future,* 2007, ABARE research report 07.16 prepared for the Department of Industry, Tourism and Resources, Canberra.

26 ClimateWorks, 2010.

27 Gurney et al.; ClimateWorks, p. 22.

Australia's performance on energy efficiency

Australia's historical record of energy efficiency improvement has been poor compared to that of other countries. Currently, we sit in the middle of the pack compared to other OECD countries. But our rate of improvement is falling behind.

Energy efficiency is difficult to measure. Australia faces some challenges in improving energy efficiency that other countries do not. But to date, energy efficiency policy endeavours at all levels of government have been piecemeal, especially when compared with the systematic approaches of many other countries. Paradoxically, our history of poor performance has left Australia with a wealth of opportunities to improve our energy efficiency performance.

This chapter begins by defining energy efficiency and presents a range of metrics for measuring and comparing energy efficiency. The chapter then:

- analyses how Australia compares to other countries and explores in detail some of the factors that affect our performance
- outlines efforts made across all levels of government to date
- analyses barriers to improving energy efficiency
- describes the National Strategy for Energy Efficiency
- presents a framework for defining and measuring a step change in energy efficiency — a key requirement of the Task Group's terms of reference.

The terms of reference explicitly require the Task Group to look for options to:

- deliver a step-change improvement in Australia's energy efficiency by 2020, and
- place Australia at the forefront of OECD energy efficiency improvement,

where these options are complementary to a broad-based carbon price and the Renewable Energy Target.

Before any options for a step change can be explored, it is sensible to consider the following questions:

- How do we define energy efficiency?
- How does Australia's past energy efficiency performance compare to that of other countries?
- What factors influence our energy efficiency performance?
- What are Australia's energy efficiency measures to date?
- How do we define a step change, and how might it be measured?

2.1 Defining energy efficiency

The term 'energy efficiency' is commonly used, yet it can mean different things to different people — technical efficiency to an engineer, economic efficiency to an economist, and energy conservation to an environmentalist.

'Technical energy efficiency' is the ratio of useful energy output of a system, process or activity relative to its input. A system, process or output with a ratio close to a value of one is 'energy efficient' because most of the energy that goes in is turned into useful output. An activity with a ratio close to zero, however, is not technically energy efficient, as much of the energy that goes in is wasted; that is, it is not transformed into useful output.

'Economic efficiency' uses the same concept of a ratio of outputs to inputs. To an economist 'output' is not necessarily a narrow physical definition but can reflect wellbeing, broadly defined.

In contrast, 'energy conservation' typically means a focus on reducing actual energy use. This can occur for a range of reasons, including because output is reduced.

Improving energy efficiency — using either the technical or the economic definition — can lead to two different outcomes. First, it can lead to more output or wellbeing being created for each unit of energy used. Second, it can lead to less energy being used to create the same amount of output or wellbeing. In both cases energy is being used more efficiently. In this sense, improving energy efficiency is akin to improving the productivity with which we use capital, labour, land or any other input to production.

In this report, the Task Group defines improved energy efficiency as using less energy to achieve the same level of outcomes or performance, or improving the level of outcomes or performance from the same amount of energy.

Energy efficiency is a useful way of comparing, for example, two refrigerators or two cars. However, for a country as a whole, energy efficiency is difficult to assess, because economies are composed of millions of devices, processes and people that use energy to produce different things. 'Energy intensity' — the ratio of the energy used in an economy to its GDP — is sometimes used as an alternative means of comparison at a macroeconomic level. While energy intensity is a useful measure, it is important to recognise that energy efficiency is only one factor affecting energy intensity; other factors such as the structure of the economy, climate and geography will also have an influence.

Table 2.1 contains key definitions that are used throughout this report.

Table 2.1 Key definitions

Energy efficiency	The ratio of outputs to energy inputs
Energy efficiency improvement	Using less energy to produce the same level of output OR using the same amount of energy to deliver a higher level of output
Energy intensity	The quantity of energy used per unit of economic output produced
Primary energy	The total of the energy consumption of each primary fuel (in energy units) in the consumption, conversion and end-use sectors.
Final energy	The total amount of energy consumed in the final or end-use energy sectors. It is equal to primary energy use less energy consumed or lost in conversion, transmission and distribution.

Whether or not improving energy efficiency leads to reduced total energy use will depend on a number of factors. Rising output — that is, a growing economy — can lead to more energy being used in total, despite the improvement in energy efficiency.

2.2 Australia's past energy efficiency performance compared to that of other countries

Comparing energy efficiency performance between countries is inherently difficult — different approaches can deliver quite different results. The simplest and most commonly used approach is to compare energy intensity — although, as noted above, this is not a perfect indicator as 'efficient' energy use will vary with national circumstances. While a low level of energy intensity is often used as a proxy for good energy efficiency performance and a high level as a proxy for poor performance, they are not the same things. For example, a service-based economy will almost certainly have lower energy intensity than an equivalently sized industry-oriented economy (even if the former uses energy less efficiently in everything it does), because services as a whole have significantly lower energy use than does manufacturing.[1]

It is possible to compare both the level of energy intensity and the rate of improvement. However, looking at only one of these two elements can also be misleading. A country can have a low level of energy intensity (implying good energy efficiency performance), but if the country is already very efficient then it may only be able to lower its energy intensity at the rate of technological improvement (that is, it may have a slow rate of improvement). Conversely, another country may show a high energy intensity (implying a poor energy efficiency performance), but may be improving rapidly as it catches up to technology leaders (meaning it is becoming more energy efficient over time, albeit from a low base).

To illustrate, between 1970 and 2006, Japan's energy intensity went from 410 tonnes of oil equivalent per dollar of GDP (toe/US$) to 298 toe/US$, whereas China's went from 1,762 toe/US$ to 432 toe/US$.[2] This comparison shows that, while Japan had a lower level of energy intensity than China over the period, China's rate of improvement was higher than Japan's. If we compare the energy intensity of the two countries based on level, Japan appears less energy intensive (which could be considered a proxy for being more energy efficient). If we compare them on their respective rates of improvement, China appears to be performing better.

But even this is not the full story. If two countries' industrial structures differ, with one specialising in energy-intensive products and the other in products that require less energy to produce, the first economy may be as efficient in every sector as its

counterpart, but have higher aggregate energy intensity because more of its GDP is derived from high-energy activities. Looking again at China and Japan, we know that the two countries specialise in producing different products and this affects both the level and rate of improvement in their energy intensity.

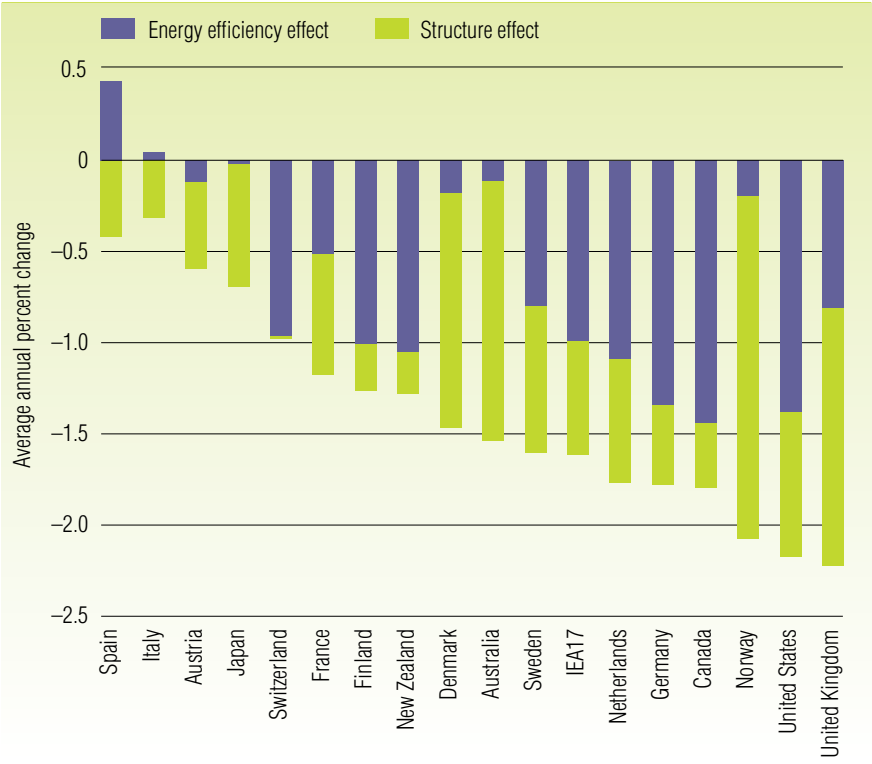
Available data suggest that overall Australia's track record on energy efficiency (when measured by energy intensity) is poor, especially in the rate of improvement. Our economy shows a high level of energy intensity (the Australian energy to GDP ratio is higher than the OECD average for the same level of per capita GDP), and a close look suggests that this has not been improving as fast as that of other countries over time. This result holds true even when attempts are made to allow for differences in economic structure between countries.

Possible international comparisons of energy efficiency performance

The International Energy Agency (IEA) and the Australian Bureau of Agricultural and Resource Economics (ABARE) both produce useful international comparisons that attempt to overcome the impact of different economic structure, although neither is ideal for the measurement task at hand. (Chapter 6 discusses the data challenges and possible policy approaches to improving Australia's energy efficiency data and analysis.)

The IEA publishes a measure that decomposes final energy intensity into two parts (Figure 2.1). The first part (called a 'structure effect') represents the change in final energy intensity due to changes in economic growth and changes in economic structure. The second part of the decomposition (the 'energy efficiency effect') is that part of the change in final energy intensity which is not due to changes in economic growth and changing industrial composition. This could represent decreased energy intensity for a given industrial composition.

Figure 2.1 Decomposition of final energy intensity changes, IEA countries, 1990–2006

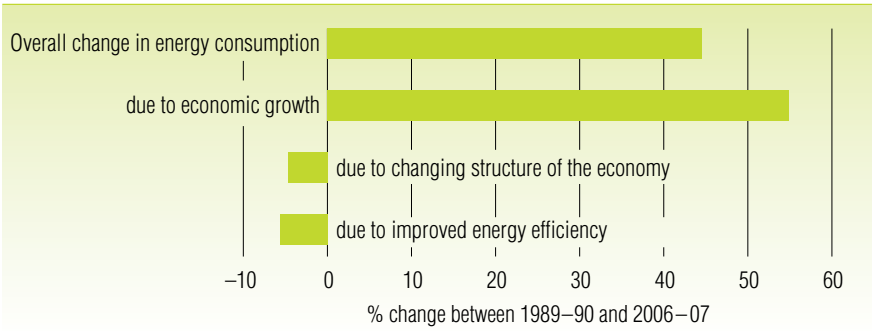


Note: The following sectors are not included in this analysis: quarrying, fuel processing, electricity, and gas and water supply.

Source: IEA, unpublished 2010 update of Figure 45 in *Implementing energy efficiency policies: Are IEA member countries on track?*, 2009.

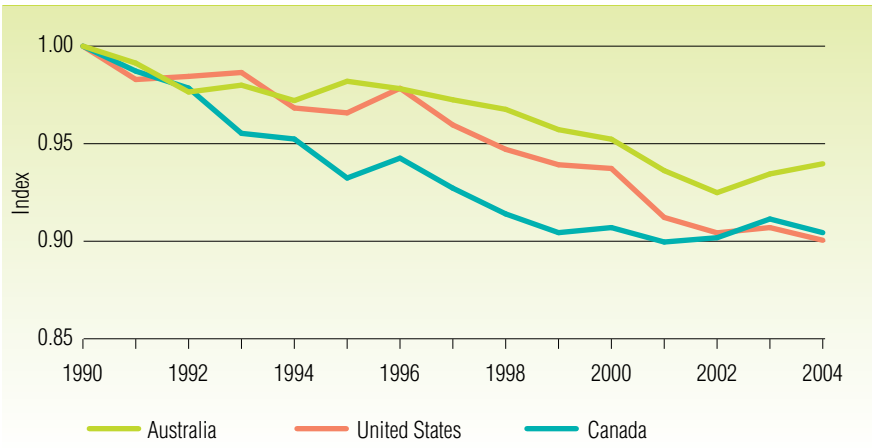
ABARE produces a similar decomposition of changes in final energy consumption for Australia (Figure 2.2).[3] In the ABARE measure, however, final energy is decomposed into three rather than two parts, as the contributions of the change in economic growth and the change in economic structure are estimated separately. ABARE also produces an index of the change in energy intensity over time that accounts for differences in economic structure (Figure 2.3). This approach can only be meaningfully used to compare countries where similar measures exist; at this stage a similar measure is available only for the United States and Canada.

Figure 2.2 Decomposition of change in final energy consumption for Australia between 1989–90 and 2006–07



Source: S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009.

Figure 2.3 Rate of change in energy intensity accounting for structural differences, 1990–2004 (indexed to the same base in 1990)



Note: This chart uses a composite indicator of energy intensity, which is calculated by aggregating energy intensities for individual sectors of the economy. For more detail about how this calculation, see Sandu & Petchey, pp. 49–50.

Source: S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009, p. 14.

Australia's rate of improvement

The IEA measure (Figure 2.1) indicates that Australia's energy intensity improved at close to the same rate as that of other IEA countries over the period 1990 to 2006 (1.5 per cent per year for Australia compared to an average of 1.7 per cent per year). It also shows that most of the change in energy intensity was due to changes in the structure of the economy (the structure effect in Figure 2.1) rather than to more efficient use of energy for a given industrial composition (the energy efficiency effect in Figure 2.1). This energy efficiency effect reduced final energy intensity by around 0.2 per cent per year over the period. The efficiency effects for Canada, Germany, the Netherlands, New Zealand and the United States show that they all improved their within-sector energy intensity by 1 per cent or more per year on average over the same period.

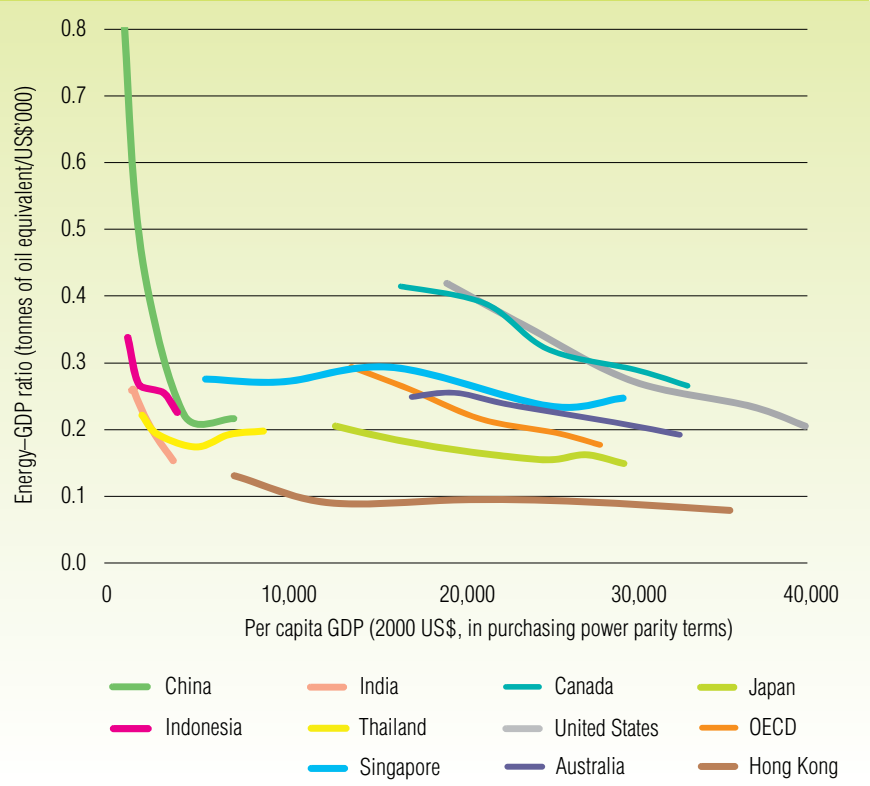
Put another way, while the improvement in end-use energy intensity is close to the average, more of Australia's overall improvement has occurred through changes in the structure of the economy than in other countries. This suggests that a rapid switch in Australia away from energy-intensive manufacturing and towards a services-based economy (which is less energy intensive) may have masked relatively slow changes in energy efficiency within sectors relative to developments elsewhere.

The ABARE measure shows a similar story (Figure 2.3). Over the period 1990 to 2004, the efficiency effect (the change in energy intensity not accounted for by changes in activity or economic structure) was a fall in intensity of 0.4 per cent per year in Australia and 0.7 per cent per year in the United States and Canada.

Figure 2.4 provides another way of looking at comparative rates of change in energy intensity. It compares long-term change in energy intensity against increases in wealth per capita in a range of countries between 1970 and 2006. The key message from this is that countries can significantly improve their energy intensity while growing wealthier.

Australia's performance is close to, but slightly worse than, the OECD average, although we are still in the middle of the pack. The United States and Canada have seen even sharper improvements in energy intensity (that is, stronger vertical movement) while continuing to improve per capita GDP.

Figure 2.4 Energy to GDP ratio, selected countries, 1970–2006



Source: S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009, p. 13.

Overall, both the IEA and ABARE measures point to the fact that the energy efficiency component of final energy intensity has declined faster in other developed countries than in Australia over the recent past. This is consistent with anecdotal and other evidence presented to the Task Group that there is ample scope for Australian businesses and households to improve their energy efficiency.

The relatively slow rate of improvement in Australia's energy efficiency in the past paradoxically means that a faster rate of improvement is possible as we play 'catch-up'. As Garnaut has wryly observed, 'Australia's past profligacy in energy

Australia's past profligacy in energy use has left an exceptional legacy of opportunities for low-cost energy savings in business and amongst households

Ross Garnaut

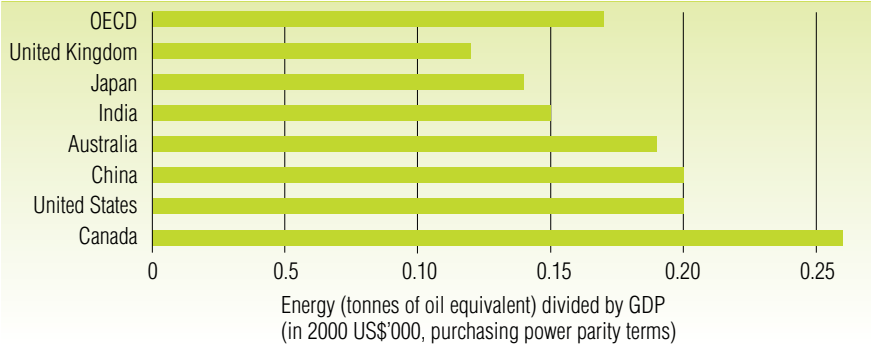
use has left an exceptional legacy of opportunities for low-cost energy savings in business and amongst households'.[4]

Both the IEA and ABARE measures focus on final rather than primary energy use. This means that they exclude energy efficiency improvements made in the generation, transmission or distribution of energy. As discussed in chapter 12, these areas are also a rich potential source of improvements in energy efficiency from a national perspective.

Australia's level of energy intensity

Australia's level of energy intensity is higher than the OECD average (Figure 2.5). The IEA notes that this is largely due to Australia's relatively low energy prices, long transport distances and energy-intensive industrial structure.[5] While these factors may explain our level of energy intensity, our slow rate of improvement raises more challenges.

Figure 2.5 International energy intensity, 2007



Source: IEA, *Key world energy statistics*, 2009.

Our relatively high level of energy intensity is also a reminder that Australia's energy efficiency policies, programs and standards have been and remain less stringent and less extensive than those in more energy-efficient countries. This in part reflects the fact that Australia's historically low energy prices have reduced the economic incentives to improve energy efficiency performance. The effects of these factors are discussed further in section 2.3.

2.3 Issues affecting better performance

It is often said that if energy efficiency is such a good idea it would have happened already. So why is it that, if there are a wide range of benefits from improving energy efficiency, these benefits are not being realised now? And is there a case for government intervention? Answering these questions means considering a range of identified energy efficiency barriers as well as energy prices.

Energy prices

Like capital, labour and land, energy is a production input — improving energy efficiency performance is akin to improving the productivity of any other production input.

The amount of production inputs used in a process or system will be a function of the cost of those inputs. When an input is cheap, we tend to use more of it; when it is expensive, we tend to use less. This holds true for energy, and it follows that the amount of available technical energy efficiency improvement that is also economically efficient will, in part, reflect the cost of energy.

Comparing changes in energy efficiency between countries does not provide a completely satisfactory indicator of technical energy efficiency achievements if energy prices in those countries are substantially different, or are changing at

different rates. Put simply, countries with higher energy prices have more economic incentives to improve their energy efficiency because their energy prices are high. These countries may show better absolute levels of energy efficiency and/or better rates of improvement with seemingly fewer or less stringent policies because higher energy prices drive greater action.

Accordingly, while energy intensity may be the best available way of comparing Australia to other countries, we should exercise caution when drawing policy conclusions from international comparisons that are based solely on energy intensity and do not take account of the cost of energy supply.

Australia's historically low energy prices have meant that there have been fewer cost-effective energy efficiency opportunities in Australia than in most other countries. Even if comparable broad-based carbon prices were introduced in all countries, energy costs would still vary between countries. Moreover, while higher energy prices may increase the number of cost-effective opportunities, some opportunities may not be taken up if the barriers discussed below are present.

Barriers to energy efficiency

There is an extensive literature on the barriers to improved energy efficiency. The Task Group believes that some of the many barriers identified are material and should be addressed, even if only on a transitional basis pending the introduction and maturing of a carbon price. In other cases, there is little or no justification for government intervention. A sound understanding of barriers and how they interact in real markets is critical to understanding whether, and how, government should respond.

The first category of barriers is what economists would consider market failures. Markets are not, on their own, able to overcome these barriers, and intervention may be justified to address them on an ongoing basis.

The Productivity Commission[6] and Garnaut[7] identified the key market failures as public good information, information asymmetry, bounded rationality and externalities. These reports also identified regulatory failures, where existing government regulations, programs and taxation impede cost-effective energy efficiency.

A number of barriers, however, are not market failures. Given sufficient focus and time, markets could overcome these barriers by developing innovative products and services. These barriers particularly relate to a lack of skills and information that have a marketable value. However, given historically low energy prices and the range of other barriers that impede energy efficiency, it may be unlikely that the market will overcome these barriers in the short to medium term. Effective government intervention could support the market to overcome such barriers.

These barriers do not act in isolation. Traditional market failures interact with each other and with other barriers. For example, historically limited demand by Australian energy users for energy efficiency retrofits means that most financial institutions in Australia have not developed the intellectual property and products that they need to finance energy efficiency. At the same time, the widespread lack of access to energy efficiency finance means that demand for energy efficiency upgrades has been constrained.

The Task Group considers the following to be the broad categories of material barriers to energy efficiency:

- lack of information and skills, and uninformed decision-making
- externalities that distort the prices for energy, energy efficiency, products or services
- regulatory and planning practices.

Information, skills and decision-making

Informational barriers are discussed at length in the final report of the Garnaut Climate Change Review.[8] These are set out below.

Undersupply of information that has 'public good characteristics'

Garnaut states:

> Where information has public good characteristics, it is likely to be under-provided by the private sector [citation omitted]. The private sector may disseminate information with public good characteristics, for example through consumer magazines. However, as firms are not able to capture all the benefits from public good information, there is insufficient incentive to make information as extensive and widely available as consumers may demand.[9]

Skills gaps

Skills gaps can be experienced by energy users, companies providing dedicated energy efficiency services and companies providing auxiliary services such as finance, valuation and legal services. Skills gaps partly arise from gaps in training and education, but they are exacerbated by other market failures that hinder energy efficiency sufficiently to reduce motivation for a wide range of parties to invest in improving skills. Skills gaps in just one profession can impede energy efficiency upgrades. This can create a circular problem, where gaps generate further gaps. For example, a skills gap in the finance sector in understanding the likely returns from an energy efficiency project could reduce the ability for other sectors to invest in energy efficiency. This would in turn mean that skills in designing and implementing energy efficiency projects do not develop.

Split incentives (principal–agent problems)

Principal–agent problems occur where

> one person (the principal) pays an agent for a service, but the parties face different incentives and the principal cannot ensure that the agent acts in her best interest. For example, landlords (agents) selecting fixed appliances for their rental property do not face the same incentives as renters (principals) to lower the ongoing energy cost of the appliances [citation omitted].[10]

Principal–agent problems are also often referred to as 'split incentives'.

Behavioural, organisational and cultural factors

Even if parties have access to accurate information, they do not always make optimal decisions, especially where well-established norms affect decision-making. If decision-makers do not perceive energy efficiency to be 'material' (for example, energy costs are a relatively small proportion of a business's total costs), they may not even investigate potentially very profitable energy efficiency options that will more than pay for their technical costs and the time to implement them. Substantial energy efficiency upgrades that can deliver good rates of return may be unable to access capital expenditure budgets, or be overlooked in favour of projects that increase production but deliver lower rates of return.

Behavioural, organisational and cultural factors overlap with information and skills gaps, but addressing them can be substantially more complex. For example, simply providing information on the benefits of discussing energy efficiency at a company board level will rarely convince a company to do so. Information needs to be carefully tailored and delivered. Mandatory approaches, such as the Australian Government's Energy Efficiency Opportunities program, have proved to be highly effective in raising the profile of energy efficiency issues. In addition, while it can take many years to change norms, once those norms are changed it is likely that the case for government intervention will be significantly reduced.

Externalities

Energy use can create a range of externalities, including local air pollution. The most obvious externality is the failure by individuals and organisations to pay for the damages that arise from their greenhouse gas emissions, hence the importance of introducing a carbon price.

Similarly, instituting measures to increase energy efficiency can also create benefits for other parties, such as reducing the need for electricity network owners to invest in expanding the network.

Finally, research, development and demonstration (RD&D) of energy-efficient technologies in a new context — even technologies that are relatively well established abroad — can create significant benefits. Parties that undertake RD&D in energy-efficient technologies and services, including first movers in a market, face higher costs and generate benefits for those that subsequently use those technologies or services. Well-designed intervention by government, while not automatically justified, can sometimes provide the catalyst for and leverage private investment that would not otherwise be forthcoming.

Regulatory and planning practices

Existing government programs, regulations and taxation rules can affect the take-up of energy efficiency opportunities. Regulatory failures can completely impede some activities, or can distort the costs and benefits of those activities, in some cases creating externalities. Regulation can also have perverse effects. For example, the review of Australia's future tax system notes that the current fringe benefits tax formula for work vehicles creates an incentive to drive longer distances.[11]

Governments are strongly engaged in planning and regulating network infrastructure like roads and the interconnected electricity market. The Task Group received numerous submissions discussing whether the National Electricity Market objective, rules and regulations impede energy efficiency. In particular, there were questions about whether the current pricing regime creates externalities, with energy consumers potentially undercharged for the load that they put on the network and, conversely, under-rewarded for improvements in energy efficiency that benefit the network.

Interactions between barriers

All these barriers may interact. For example, regulatory factors, network infrastructure and unpriced externalities can distort the cost of energy, reducing the benefits of investing in energy efficiency. As a result, the incentive for companies to invest in improving staff knowledge and skills on this issue is reduced. Lack of skills makes it harder for parties to coordinate, further impeding energy efficiency.

These barriers are not unique to Australia, but Australia does face some particular challenges that many other developed nations do not. Australia's energy efficiency performance has been affected by the size of the Australian continent, our low population density, the distance between our cities, and the presence of a number of energy-intensive sectors such as minerals processing.

Forms of government intervention

The existence of barriers does not necessarily justify government intervention. Intervention must be sufficiently successful that the net benefits outweigh the costs of leaving the market failure unaddressed. This issue is taken up in the context of individual proposals in this report.

Various sectors will reflect differently some or all of the barriers and challenges discussed above. In some sectors it will be easier to make incremental improvements

in energy efficiency by overcoming one barrier at a time. For example, a highly motivated company might achieve small reductions in energy use by improving information flows, make further gains by investing in the skills of its employees, and then move on to obtaining the money needed to invest in larger-scale improvements.

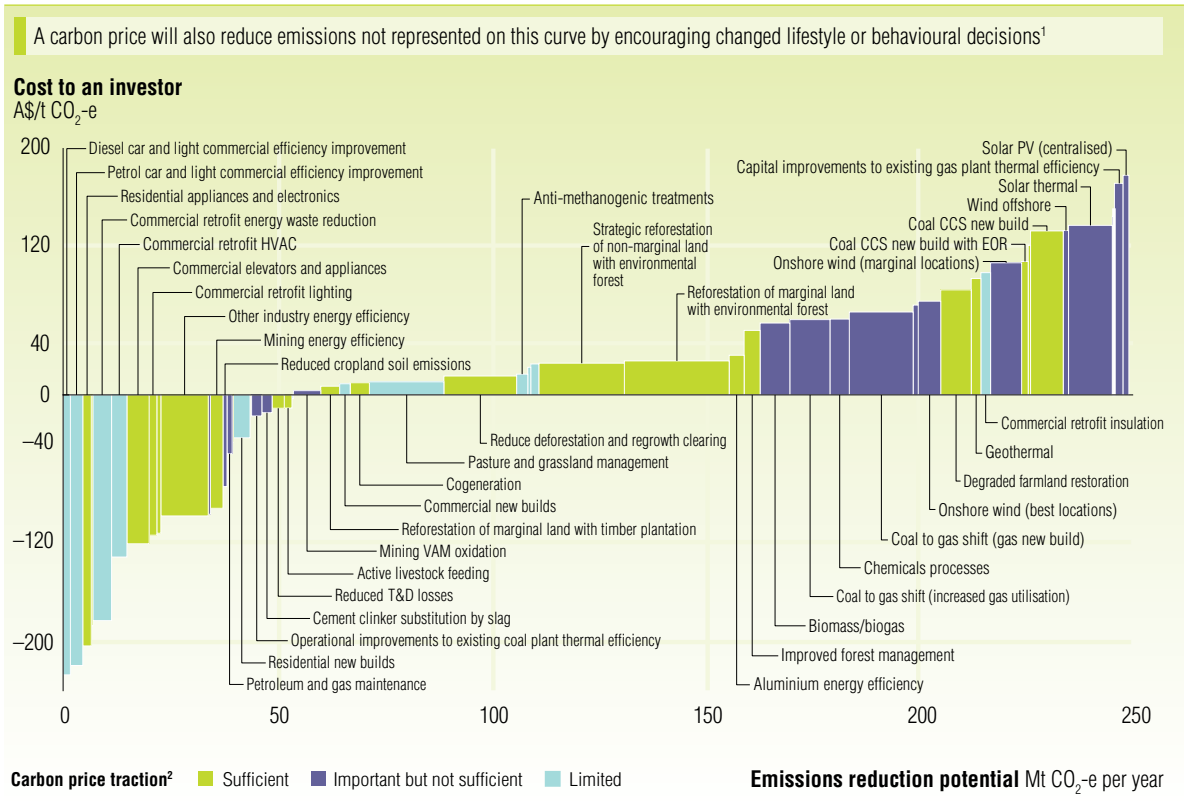
In other sectors improvements will be difficult unless several barriers are removed simultaneously. For example, a low-income family in a rented home will need access to finance, removal of the split incentive, and information about what their options are before they can make changes to their energy use. Providing only one of these will not be enough. Faced with this combination, they may well decide that making any change is too hard.

This range of experiences of the barriers to improving energy efficiency calls for an integrated strategy to remove multiple barriers so that measures to target specific barriers also work together effectively.

Importantly, many of the non-price barriers described above will continue to exist even with a carbon price. Figure 2.6 presents an analysis by ClimateWorks Australia that compares a range of abatement opportunities (including energy efficiency) and assesses which of these might respond strongly to a carbon price. The analysis shows that many energy efficiency opportunities will not be taken up even with a carbon price — implying that non-price barriers are still present. This is why government intervention to improve energy efficiency may be complementary to a carbon price. As Stern has pointed out:

> Widespread failures and barriers in … markets result in significant untapped energy efficiency potential in the buildings, transport, industry, agriculture and power sectors. These obstacles mean it is necessary to go beyond policies to establish carbon markets …[12]

Figure 2.6 Example of carbon price traction on a range of abatement measures



1. Such as reduced consumption (for example, turning lights off, driving fewer kilometres) and switching to less carbon-intensive forms of consumption (for example, using public transport instead of driving).
2. Assumes a carbon price large enough to make each opportunity profitable.

Source: ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010, p. 24.

2.4 Australia's energy efficiency measures to date

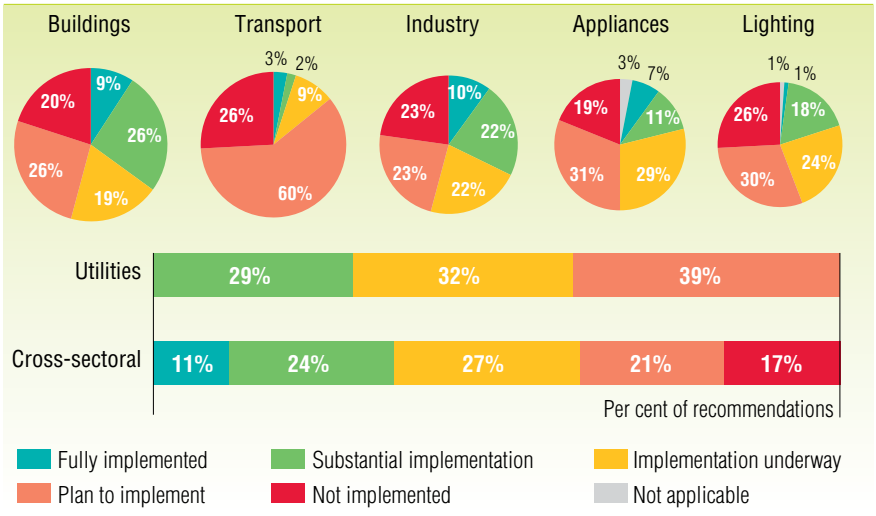
Australian governments have actively promoted improvements in energy efficiency for many years. Well over 200 existing energy efficiency policies and programs are in place at all levels of government. The Australian Government has previously announced over $4 billion in support for energy efficiency measures. Existing energy efficiency programs include regulatory reform; provision of better information on energy efficiency; capacity building; research and development; price signals; and financial incentives. Current measures are expected to have delivered more than 38 million tonnes of abatement in 2020, which is already reflected in the business-as-usual projections of emissions (see Box 1.1 in chapter 1).[13]

However, despite these actions Australia has not consciously or explicitly targeted world best practice in energy efficiency policy and, by comparison with other countries, has significant gaps in its energy efficiency policy armoury. The International Energy Agency found that Australia is judged to have 'fully implemented' less than 20 per cent of the IEA's 25 key energy efficiency recommendations.

While no country has fully implemented all of the IEA's recommendations, the most active countries (Japan and the United Kingdom) have fully or substantially implemented more than half of them, and are in the process of implementing, or plan to implement, a further 40 per cent. When compared to other countries, Australia sits near the middle of the pack, performing better in some areas than others. For example, on appliances, Australia has implemented more recommendations than the IEA average, whereas on transport, we lag significantly (see Figure 2.7 and Figure 2.8).

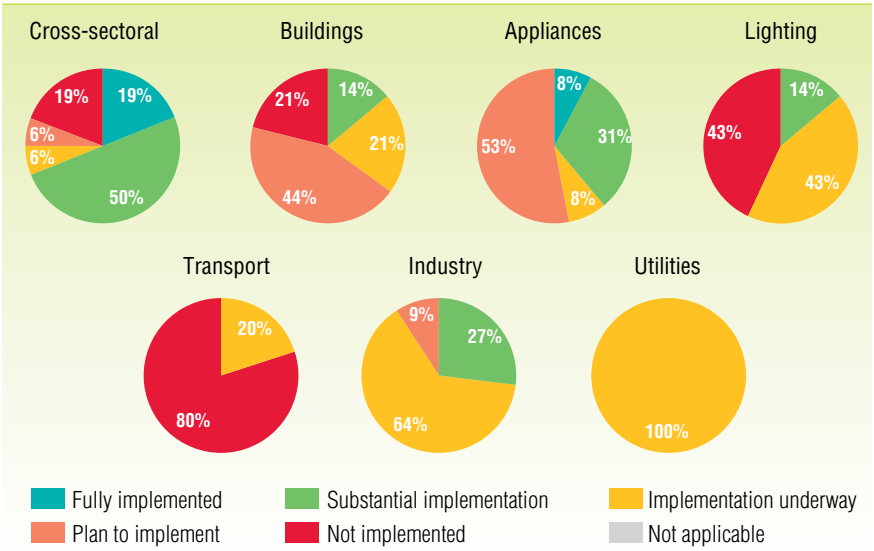
This IEA analysis does not assess or compare the stringency of policies between countries, or the breadth of total policy coverage (beyond the 25 recommended). For example, some examinations of the relative stringency of building codes between countries, while fraught with technical difficulties, have suggested considerably lower stringency in Australia than in other OECD countries.[14] That said, there are also examples of highly successful energy efficiency measures in Australia, with the long-standing minimum energy performance standards and labelling program a case in point.

Figure 2.7 Progress with implementing IEA 25 energy efficiency recommendations, all recommendations, all IEA countries



Source: IEA, *Implementing energy efficiency policies: Are IEA member countries on track?*, 2009.

Figure 2.8 Australia's progress with implementing IEA energy efficiency recommendations



Source: IEA, *Implementing energy efficiency policies: Are IEA member countries on track?*, 2009.

Australian governments' approaches to energy efficiency to date have often been piecemeal and not obviously designed to capture the most cost-effective energy efficiency opportunities. Some measures have been costly and may have failed to achieve any significant improvements in energy efficiency.

Overlaps between certain measures have resulted in different levels of government implementing different measures with similar objectives — providing no additionality in terms of energy efficiency or abatement. For example, state-based energy efficiency trading schemes subsidised the removal of inefficient light bulbs, which were also subject to a mandatory phase-out from sale through Commonwealth regulation; and solar water heaters have been subsidised through rebates, in addition to substantial subsidies from renewable energy certificates under the Australian Government's Renewable Energy Target.

Several submissions to the Task Group commented on this general point:

> Presently, there is considerable overlap and duplication in reporting on energy usage and efficiency at the federal and state government levels, which if harmonised and streamlined would reduce the compliance burden on business and potentially enable a stronger business focus on energy efficiency improvements.
>
> Bureau of Steel Manufacturers of Australia submission to the Task Group

> Administrative complexity and overlap adds to the cost of program implementation, from both Government and business perspectives, and has the potential to undermine the desired outcomes.
>
> Rio Tinto submission to the Task Group

National Strategy on Energy Efficiency

In July 2009, the Council of Australian Governments (COAG) agreed to the National Strategy on Energy Efficiency as part of the National Partnership Agreement on Energy Efficiency. Through the National Strategy, the Commonwealth, state and territory governments have committed to a nationally consistent and coordinated approach to energy efficiency. This includes the implementation of a range of measures to assist in delivering cost-effective energy efficiency gains across the economy.

The National Strategy encompasses a range of sectors where significant energy efficiency opportunities exist: commercial buildings; residential buildings; electricity markets; appliances and equipment; industry and business; government; transport; skills and training; innovation; and advice and education. Appendix D contains further detail on the National Strategy and compares its measures with those outlined or recommended by the Task Group in this report.

While the National Strategy largely allocates responsibility for individual measures to current committees or individual departments, it does not significantly address the issue of governance or institutional reform. Many of the submissions to the Task Group emphasised that the National Strategy has not been effective in curbing the proliferation of overlapping and inconsistent federal, state and territory, and regional measures.

> There are numerous programs administered by States and Territories and by the Federal government with large overlaps, conflicting objectives and often different understandings of what energy efficiency means and how it can be measured. Many programs are legacies of a time when States and Territories implemented such programs as substitutes for Federal inertia.
>
> Engineers Australia submission to the Task Group

Several submissions highlighted that implementation under the National Strategy (and the associated National Framework for Energy Efficiency) has been slow to date:

> The Heating Ventilation and Air Conditioning High Efficiency System Strategy (HVAC HESS) is a series of 23 proposed measures over a ten year time frame to deliver annual greenhouse emissions reductions of as much as 4 million tonnes and energy cost savings of around $350 million per annum … Unfortunately the implementation of the HVAC HESS has not started well.
>
> Australian Institute of Refrigeration Air Conditioning and Heating submission to the Task Group

> A number of suggestions for overcoming barriers to energy efficiency sit within the National Framework for Energy Efficiency which has been agreed to by all COAG members. Our concern is that while the Framework provides many good ideas and strategies for increasing energy efficiency, there appears to be little compulsion, or incentives for governments to act on their responsibilities in this area.
>
> Tasmanian Council of Social Service submission to the Task Group

Moreover, the National Strategy is very much directed at specific sectoral improvements, and lacks, to some extent, overarching foundation measures to drive energy efficiency improvement widely throughout the economy.

The proposals — both foundation and others — in this report would build on the measures in the National Strategy, and work to address existing concerns with the strategy while providing an additional focus on 'the ceiling' (encouraging innovative step-change improvements) rather than 'the floor' (minimum standards and base measures).

2.5 Defining a 'step change'

The Task Group's terms of reference were explicit in focusing on the need to deliver a step-change improvement in energy efficiency by 2020.

From the data presented in this report, in order to be at the forefront of OECD energy efficiency improvement Australia will need to take dramatic and sustained action.

Realising a step change will require:

- increased awareness of, and attention to, improved energy efficiency
- eliminating or reducing the effect of a range of barriers that block or discourage worthwhile action, including moving towards full energy pricing through the introduction of a broad-based carbon price.

Achieving a step change in energy efficiency improvement is not a simple task — indeed, it is likely to take a sustained commitment over the next decade. Australians will need to make choices on investment in energy and its use.

Measuring our progress towards a step change in energy efficiency is not without difficulty, either. As discussed earlier in this chapter, energy efficiency is not the same as energy intensity and (notwithstanding its common use) energy intensity is not a completely satisfactory indicator for making comparisons between countries. But energy intensity is nonetheless one of the few aggregate measures that can provide useful guidance on a step change and allow comparisons to be made across time and between countries.

Given Australia's circumstances, it is most useful to focus our efforts on accelerating the rate of improvement in energy intensity. This is the change we need to achieve. A step-change target could be usefully quantified as a material improvement in Australia's primary energy intensity over the period 2010 to 2020 relative to the improvement that we would expect to achieve under current policy settings. Under existing policy settings, Australia's energy intensity is projected to fall by 16 per cent over this period, due to trend improvements in energy use within sectors and increases in the relative size of less energy-intensive sectors as a share of Australian economic activity.[15]

Even after a material change in the rate of improvement, Australia's actual level of energy intensity may still not be at a level similar to those countries that are at the forefront of the OECD. For example, Australia could make a large change each year without necessarily reaching the level of the least energy-intensive developed economies such as Japan or the United Kingdom (even after controlling for differences in economic structure across the three countries).

Moreover, the goal should be seen relative to other countries' current or future performance, which is — naturally — as yet unknown. If other OECD countries successfully make great improvements in their energy efficiency over the period to 2020, Australia may realise a genuine step change in energy efficiency improvement but may still not attain a large improvement relative to other OECD countries, particularly those that already have an explicit carbon price in place.

2.6 Tracking our progress

As noted in section 2.3, the data used to make comparisons between countries do not allow us to account for differences in underlying costs of energy between countries. Current international comparison measures also use final rather than primary energy use, meaning that they exclude energy efficiency improvements made in the generation, transmission and distribution of energy.

Notwithstanding their limitations, current measures suggest that being at the forefront of OECD improvement will require a substantial increase in our rate of energy efficiency improvement. Achieving this will require an ambitious approach to energy efficiency alongside an explicit carbon price.

Australia should aim to meet the step-change goal through an improvement in primary energy intensity relative to the fall of 16 per cent over 2010–2020 projected under current policy settings. Setting an explicit national target for energy efficiency could also assist in achieving a step change. The role and size of such a target is discussed in chapter 3.

Notes

1 A Syed, J Melanie, S Thorpe & K Penney, *Australian energy projections to 2029–30*, ABARE research report 20.02, March 2010, p. 7.

2 S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009.

3 Sandu & Petchey, pp. 14–15.

4 Garnaut Climate Change Review, *Interim report to the Commonwealth, state and territory governments of Australia*, February 2008.

5 IEA, *Implementing energy efficiency policies 2009: Are IEA member countries on track?*, OECD/IEA, Paris, 2009, p. 53.

6 Productivity Commission, *The private cost effectiveness of energy efficiency,* Commonwealth of Australia, 2005 p. 47.

7 R Garnaut, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008, pp. 406–13.

8 Garnaut, pp. 406–13.

9 Garnaut, p. 406.

10 Garnaut, p. 413.

11 *Australia's future tax system:* Report to the Treasurer, Commonwealth of Australia, December 2009.

12 N Stern, *The economics of climate change: The Stern Review*, Cambridge University Press, Cambridge, 2007, p. 451.

13 Department of Climate Change, *Australia's fifth national communication on climate change*, report under the United Nations Framework Convention on Climate Change, 2010.

14 See, for example, A Pears, *Making a greenhouse difference with Australia's buildings,* conference paper published in the proceedings of 'Building Australia's future 2009', September 2009; and *Comparison of building energy performance standards,* Centre for Design, RMIT, September 2005.

15 Unpublished data underlying *Australia's fifth national communication on climate change.*

Foundations

An energy efficiency target — driving a step change and positioning Australia at the forefront of the OECD

A national aspirational energy efficiency target would provide an overarching vision for energy efficiency by aggregating the expected outcomes of individual energy efficiency policies into a single, easily communicated target.

Setting an energy efficiency target of improving Australia's level of primary energy intensity by 30 per cent from 2010 to 2020 would be ambitious but achievable. This is equivalent to moving from a future in which energy consumption per person stays roughly constant to a future in which energy consumption per person decreases by 16 per cent over the coming decade.

Realising a step change in energy efficiency will require a change in the way we go about using energy in our businesses and our daily lives.

A change to a more energy-efficient culture would need to be supported by a broad-based carbon price, better information about energy efficiency and a well-designed set of transitional and complementary energy efficiency policies. A national aspirational target for energy efficiency, informed by a realistic estimate of what additional energy efficiency policies can achieve, could help track progress towards a step change, providing motivation and guidance for action and contributing to a shared understanding of Australia's energy efficiency goal.

3.1 International energy efficiency targets

Increasingly, governments around the world are seeking to drive improved energy efficiency — in part through setting ambitious targets for energy consumption or energy intensity.

- The 27 countries in the European Union have agreed to reduce energy consumption by 20 per cent below business as usual levels by 2020.
- China is on track to meet a target of a 20 per cent improvement on its 2005 level of energy intensity by 2010 and has committed to reduce intensity by 40–45 per cent on 2005 levels by 2020.
- Russia has a target of reducing energy intensity by 40 per cent below 2007 levels by 2020.
- Asia–Pacific Economic Cooperation (APEC) members, including Australia, have a regional goal of reducing energy intensity by at least 25 per cent on 2005 levels by 2030.

A summary of international energy efficiency targets is at Appendix E.[1]

The likelihood of a country achieving an ambitious energy efficiency target depends on the quality of that country's underlying energy efficiency policies. The key role of an energy efficiency target is to complement individual energy efficiency policies by summing their expected outcomes into a single, meaningful figure that motivates action and improves understanding on energy efficiency.

3.2 An energy efficiency target for Australia

Setting a clearly defined and communicated national aspirational energy efficiency target could have a range of benefits.

- A target could help to communicate that energy efficiency is important and motivate action to improve the energy efficiency performance of our households, businesses and government agencies.
- It would demonstrate a long-term commitment to energy efficiency programs and support the policy coherence required to deliver a step change by 2020.
- It would provide a benchmark and concrete indication of the level of effort required on energy efficiency. This could be useful in evaluating the effectiveness and contribution of Australia's individual policies on energy efficiency and facilitating ongoing calibration of the energy efficiency policy mix.
- A credible target could contribute to the policy clarity required for investment in technologies and business models in their early deployment stages.
- A target could help reduce the risk that policy decisions in other areas are inconsistent with our energy efficiency goals.

Quantifying and expressing the target

An energy efficiency target could be expressed in a number of different ways.

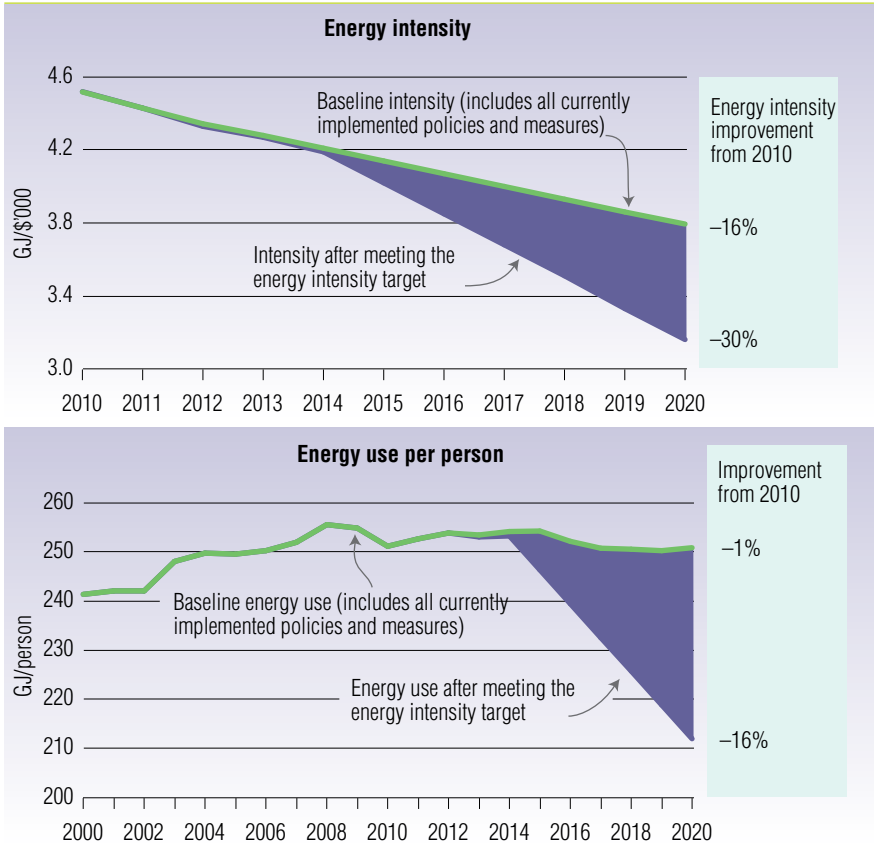
As noted in chapter 2, a step change in energy efficiency would lead to a material improvement in Australia's primary energy intensity over the next decade.

Analysis undertaken for the Task Group suggests that setting a target of improving Australia's primary energy intensity by 30 per cent from 2010 to 2020 would be ambitious but achievable.

Setting a target of improving Australia's primary energy intensity by 30 per cent from 2010 to 2020 would be ambitious but achievable.

Meeting this target would represent a 14 percentage point improvement on the 2020 outcome expected under existing policies. The latest available economic and energy projections suggest that without additional policy action and without the introduction of a broad-based carbon price, energy intensity would improve by 16 per cent over the period 2010 to 2020, equivalent to an average annual improvement rate of 1.7 per cent per year.[2] Meeting a 30 per cent energy efficiency target would more than double our annual rate of energy intensity improvement to 3.5 per cent per year (see Figure 3.1).

Figure 3.1 Projected primary energy intensity and energy consumption per person in Australia, with and without an energy efficiency target



Note: The indicative trajectory to the national energy efficiency target shown in these graphs assumes the introduction of a broad-based carbon price in 2014–15.

Source: Prepared by DCCEE for the Task Group.

Achieving this ambitious target would require Australian households, businesses and government agencies to change the priority they give to energy efficiency. This change would need to be underpinned by significant new energy efficiency policies and a broad-based carbon price. A national energy efficiency obligation (such as the energy savings initiative outlined in chapter 4) would contribute to, but not by itself be sufficient for, meeting this target (see Box 4.4).

A national aspirational target will be most effective in motivating Australians to improve energy efficiency if it is easily understood. Choices about how the target is expressed will influence how well people understand the target, and hence whether setting a target achieves the benefits outlined above. With this in mind, the Task Group notes that the energy intensity target could also be expressed in terms of a change in projected energy consumption per person.

With current projections for population growth, the recommended energy intensity target is equivalent to moving from a future in which energy consumption per person stays roughly constant over the decade to a future in which energy consumption per person decreases by 16 per cent over the decade.

Box 3.1 What would a more energy-efficient Australia look like?

What would meeting the 2020 energy efficiency target mean for Australian households and businesses?

If Australia made a step change in energy efficiency, the biggest difference would be the emergence of an energy efficiency culture, with Australian households and businesses feeling more aware of their energy choices and needs.

For households in 2020 this might mean:

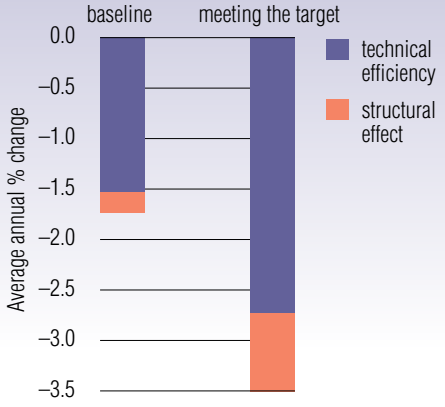
- being able to choose a new car that uses less petrol per kilometre than the previous family car of the same size
- being able to live in a home that is comfortable all year round, with efficient heating and cooling appliances that are well matched with house design
- more manageable energy bills even in the face of rising energy prices.

The introduction of a national energy savings initiative as part of our approach to meeting the 2020 energy efficiency target would support an Australian energy efficiency culture and help households and businesses to save money and energy. Businesses of all sizes would have easy access to the information and services they needed to reap the financial and other benefits of improved energy efficiency. They would be supported by accessible and reliable advice from energy service providers and financial institutions that understood and valued the financial returns from energy efficiency improvements. Large businesses, in particular, would operate in an environment where good energy management and energy efficiency performance were viewed as indicators of a well-managed business.

With or without meeting an energy efficiency target, average real incomes per person are expected to grow by at least $4,000 by 2020.[3] Because energy efficiency is about reducing the amount of energy we need to achieve an outcome or make a product, businesses and households would have lower energy bills in a more energy-efficient Australia than if we were to take no action. Overall, using energy more efficiently will mean Australian households and businesses have more money to spend on other things while living more comfortably and increasing their productivity.

The bulk of the 1.8 percentage point per year improvement (from 1.7 to 3.5 per cent) under the target would be expected to come from energy efficiency as measured by the IEA (see section 2.2). Figure 3.2 shows how the amount of Australia's overall improvement in primary energy intensity that is expected to come from technical energy efficiency rather than structural change is projected to increase under the proposed energy efficiency target. Under the 30 per cent energy efficiency target, technical efficiency improvement is expected to increase from around 1.5 per cent per year to more than 2.5 per cent per year, an increase of nearly 80 per cent per year.

Figure 3.2 Projected decomposition of Australia's primary energy intensity, with and without an energy efficiency target, 2010–2020



Note: The structural and technical efficiency effects are based on data from *Australia's low pollution future: The economics of climate change mitigation*, 2008. Projected economic changes associated with a 30 per cent energy efficiency target are consistent with those projected with a broad-based carbon price for the CPRS –5 and CPRS –15 scenarios. Strong economic growth continues at the national level, with continuing trend growth at the sector level. Policy action consistent with the target is projected to result in some sectors growing more rapidly, while others grow relative to current levels, but less rapidly than projected in the baseline (without policy action). This results in sectors accounting for slightly different shares of total economic activity, and giving rise to a larger projected structural effect under the target scenario than in the baseline.

Source: Prepared by DCCEE for the Task Group.

Table 3.1 compares expressions of the proposed target in terms of energy intensity and energy per person. The table also shows the expected effects on energy intensity and energy per person of an illustrative strong energy efficiency package combined with the introduction of the Carbon Pollution Reduction Scheme (CPRS).

Table 3.1 Comparing ways to express Australia's proposed energy efficiency target

Metric	Current (2010) value	Projected 2020 value		
		Baseline	Illustrative strong energy efficiency package and CPRS[a]	Meeting the –30% energy efficiency target
Energy intensity				
Energy intensity (GJ/$'000)	4.5	3.8	3.4 to 3.2	3.2
Average annual change, 2010 to 2020 (%)		–1.7	–2.9 to –3.3	–3.5
Total change, 2010 to 2020 (%)		–16	–26 to –29	–30
Energy per person				
Energy per person (GJ/person)	251	249	221 to 211	212
Average annual change, 2010 to 2020 (%)		–0.1	–1.3 to –1.7	–1.7
Total change, 2010 to 2020 (%)		–1	–12 to –16	–16

a. The range presented in this column represents different configurations of energy efficiency measures and the effect of projected CPRS –5 and –15 carbon prices on supporting an energy efficiency culture.

Source: DCCEE estimates drawing on data underlying *Australia's fifth national communication on climate change.*

3.3 Monitoring progress towards the target

The Government could choose to promote and disseminate information on opportunities for all Australians to help meet the target and report annually on progress. Chapter 7 discusses ways the Government can engage Australians about opportunities for improving energy efficiency and chapter 6 discusses collecting and analysing data on Australia's energy efficiency performance, which will be necessary for adequately tracking progress toward any target and providing the evidence base to make better-informed adjustments to policy settings.

Box 3.2 Relationship of the energy efficiency target to the 2020 emissions reduction and renewable energy targets

Meeting an energy efficiency target through a well-designed energy efficiency package could lower the overall cost of meeting Australia's 2020 emissions reduction target.

Energy use accounts for around two-thirds of our national greenhouse gas emissions,[4] so reducing emissions from energy use will be crucial in meeting our overall emissions reduction target. There are two main ways of reducing emissions from energy use:

- using less energy (or slowing the growth in energy use) by improving energy efficiency
- reducing emissions per unit of energy used (reducing the emissions intensity of energy or 'decarbonising' the energy supply).

Establishing a broad-based carbon price has a crucial role in achieving both of these outcomes, while renewable energy and energy efficiency policies provide important additional support. The Renewable Energy Target of 45,000 gigawatt hours in 2020 will help Australia to reduce emissions per unit of energy more quickly than a broad-based carbon price alone would.[5] Energy efficiency improvements are often low-cost ways of reducing emissions whose implementation can be blocked by non-price barriers. If specific energy efficiency policies can overcome these barriers, they offer the opportunity of accessing lower-cost emissions reductions that would otherwise be foregone.

Because the introduction of carbon pricing alone is unlikely to motivate all of the available low-cost emissions reductions from energy efficiency, well-targeted energy efficiency policies can increase the amount of abatement achieved in Australia for any particular carbon price. As energy efficiency improvements will be made in Australia, this will lower our domestic emissions per person and reduce the need to use international permits to meet our emissions reduction target.

Notes

1 While they do not have specific overarching targets, developing countries such as Brazil, Indonesia, Mauritania, Singapore, Togo and Tunisia have all committed to energy efficiency measures as part of their Copenhagen Accord commitments.

2 Unpublished data underlying *Australia's fifth national communication on climate change*.

3 Estimate based on the modelled increase in real gross national product per person, with or without the introduction of a broad-based carbon price, from Australian Government, *Australia's low pollution future: The economics of climate change mitigation: Summary,* 2008, p. 19.

4 Australia's National Greenhouse Gas Inventory.

5 Compare electricity sector emissions under 'CPRS only' and 'CPRS –5' (which includes the Renewable Energy Target) scenarios in *Australia's low pollution future*, p. 181.

An energy savings initiative—mobilising markets to deliver energy efficiency

What will it take to improve Australia's energy efficiency?

A national energy savings initiative could form the basis for a step change in Australia's energy efficiency improvement. It would do this by creating a market in energy efficiency savings to meet a mandatory obligation. It would aim to replace the different existing and planned state-based schemes.

This chapter outlines how an energy savings initiative would prepare the Australian economy for the onset of a carbon price and improve the market's ability to respond to such a signal. Energy productivity would improve overall, as would the performance of Australian firms. Householders would get additional help to improve the comfort and efficiency of their homes — while also seeing a reduction in their energy bills.

Combined with an explicit carbon price and the Renewable Energy Target, an energy savings initiative would form the final piece of a comprehensive framework of market-based instruments that work together to provide incentives for all Australians — households, businesses and industry — to contribute to reducing Australia's greenhouse gas emissions.

Initial analysis indicates that a national energy savings initiative that replaces existing state-based schemes could be delivered at very low cost. It would reduce the complexity and duplication that currently exists and would bring about significant benefits in many areas of the economy, including through a reduction in household electricity bills compared to what is currently in train.

An energy savings initiative would be a major policy instrument in Australia's energy efficiency framework. Successful implementation would require comprehensive consultation and thorough policy development that are outside the scope of the Task Group's timeframe and resources.

As discussed in chapter 2, Australia's approach to energy efficiency to date has been piecemeal and sectorally based. Creating a step change in Australia's energy efficiency performance will need a national delivery mechanism.

4.1 Delivering energy efficiency—the challenge

Analysis undertaken by the Treasury for the Australian Government (published as *Australia's low pollution future*) suggests that, outside of electricity and gas prices, the overall impact of a carbon price on consumer goods and services would be less than 1 per cent. This implies that for most sectors of the economy a rise in energy prices will be the most obvious impact from the introduction of a price on carbon. For households, this was estimated to be a $4 to $5 per week increase in electricity costs and $2 per week in gas costs, before taking account of the proposed Carbon Pollution Reduction Scheme (CPRS) compensation measures.[1]

This rise in costs resulting from the carbon price signal should encourage businesses and households to reduce their energy consumption in line with the marginal cost of action. However, as the Government noted in the CPRS Green Paper, 'the impact on households will depend critically on their capacity to change behaviour and pursue energy efficiency enhancements'.[2] This is equally true of other sectors.

As noted in chapter 2, there are many cost-effective energy efficiency opportunities available that have a low or even negative cost. However, many of these are not currently being exploited because of barriers (beyond the cost of action) that prevent individuals and companies from taking action. Many of these barriers will continue to exist even when an explicit carbon price is present.

ClimateWorks Australia demonstrates, in the 2010 *Low carbon growth plan for Australia*, that many energy efficiency opportunities that have a negative cost, as well as some with a low positive cost, are unlikely to be leveraged by a carbon price. ClimateWorks further concludes:

> Effective action to address non-price barriers will increase the amount of emissions reductions achieved for any particular carbon price, lowering the cost of achieving our national targets.[3]

As discussed in chapter 2, even without a carbon price there are benefits to the Australian economy of taking up cost-effective energy efficiency opportunities. The International Energy Agency has estimated that every dollar invested in improving energy efficiency is equivalent to two dollars invested in power generation, transmission and distribution infrastructure to build grid capacity.[4]

4.2 Energy efficiency obligations

Delivering dependable and real energy efficiency savings on the scale required for a step change will require a new initiative that goes well beyond the measures currently directed at energy efficiency barriers.

One way to achieve this would be to create an energy efficiency obligation. This would involve setting a mandatory target for energy efficiency gains that must be made in a specified timeframe. An energy efficiency obligation creates rules about what activity is eligible for meeting this target, and who falls under the obligation.

Within these broad parameters, there are myriad ways in which an energy efficiency obligation can be designed to achieve different outcomes and to suit different

circumstances. Energy efficiency obligations already in place around the world, and in three Australian states, have different targets, obligated parties, eligible activities, ways of measuring and crediting activity, penalties, trading structures and policy aims.

Without an obligation, energy efficiency is largely a private benefit. That is, all of the benefits of investing in energy efficiency remain with the person who makes the investment. Once an obligation is in place, an additional and transferable benefit is created. That is, a person who invests in energy efficiency continues to enjoy all the benefits and savings they enjoyed previously, but they also receive a credit for their investment that they can sell. It is this additional transferable value that drives the take-up of energy efficiency opportunities that were previously ignored. An example of how this might apply to a household is set out in Box 4.1.

Energy efficiency obligations are often referred to as white certificates, certificate schemes, tradeable instruments or tradeable certificates. For consistency in this report, the Task Group has used the term 'energy efficiency obligation' as a general descriptor, and 'national energy savings initiative' to refer to a model that could be considered for Australia.

Box 4.1 Example of a hypothetical energy efficiency obligation at work

Assume that the Australian Government sets a mandatory obligation for an energy retailer, who must find 40,000 units of energy efficiency savings in a year. Assume also that the Government stipulates that for each unit of the obligation that goes unmet, the energy retailer must pay a penalty of $40.

A householder might install a new heating system that achieves an energy efficiency saving of 10 units. The householder could sell these 10 units to the energy retailer, and it is assumed that the energy retailer would be willing to pay up to $40 per unit (the value of the penalty). So the householder will receive up to $400 when their new heating system is installed. The householder also continues to enjoy ongoing savings on their energy bill because their new heating system uses less energy than the old one.

Alternatively, an energy service company could replace heating systems at a discount of up to $400 (10 energy saving units at the value of the penalty) in return for the right to sell the energy efficiency savings to a retailer. The household would receive a lower-cost heating system as well as ongoing savings on energy bills, and the energy service company's business would expand. (More information about energy service companies is in chapter 13.)

This example of a mandatory obligation is very similar to what occurs for renewable energy through the Renewable Energy Target (RET), where households investing in solar water heaters or small solar power systems can claim Renewable Energy Certificates and sell them to electricity retailers, or installers offer water heaters to householders at a price that is reduced by the value of the Renewable Energy Certificates.

4.3 Benefits of an energy efficiency obligation

An energy efficiency obligation would create an incentive for businesses to seek out opportunities for individuals to save small amounts of energy, by placing a value on the aggregated energy efficiency improvements they represent.[5] It would improve technology risks for emerging technologies by adding to the returns on investment.[6] It would help reduce split incentives by providing a shared benefit (for example, the reductions in energy use would be enjoyed by the tenant, but the landlord as the investor could claim and sell the 'credit' from this).[7]

With the delay in the introduction of an explicit carbon price signal, an energy efficiency obligation would also begin to restrain growth in energy consumption, starting the economy on the path it needs to take if the 2020 emissions reduction target is to be reached (noting, as discussed in Box 4.2, that the 2020 emissions reduction target cannot be achieved without a carbon price). It would also help to shield households and businesses against price rises associated with the future introduction of a carbon price.

Box 4.2 An energy savings initiative — not a CPRS by another name

Like the RET and the CPRS, an energy savings initiative would be a market-based instrument, in that it uses regulation to create a market where one did not previously exist, in order to achieve an objective at least cost. But it would not be an emissions trading scheme.

Stationary energy makes the biggest single contribution to Australia's carbon pollution.[8] Like the RET, an energy savings initiative would be a baseline-and-credit scheme in the energy sector. Such a scheme would work in tandem with the RET to reduce emissions — the RET to decarbonise energy supply, an energy savings initiative to reduce demand (see also chapter 1).

In contrast, the CPRS is an economy-wide cap-and-trade scheme that places a cap on emissions (no matter which sector they come from) and creates a carbon price across the economy. Businesses that are subject to the CPRS can choose to acquire permits that match their emissions, or they can reduce emissions in their own operations to avoid the price.

The RET and an energy savings initiative by themselves will not achieve Australia's 2020 emissions reduction target, as they focus on only one sector of the economy, and one which is likely to continue to grow. An energy savings initiative would better prepare the economy to respond to a carbon price through energy efficiency and allow the carbon price to play a more important role in driving energy efficiency improvements as the carbon price matures. If implemented, an energy savings initiative would include a phase-down strategy linked to a mature carbon price (see Figure 4.1), noting that for some sectors even a mature carbon price will not necessarily address specific market barriers.

The CPRS is likely to capture more than 70 per cent of Australia's emissions, most of which are produced by very large companies. In contrast, an energy savings initiative would focus on individual action to restrain energy costs, while also contributing to the national greenhouse gas emissions reduction challenge.

An obligation would also help develop new businesses, such as energy service companies, whose expertise will be needed for a smooth transition to an economy with an explicit price on carbon.[9] Experience in Italy found that 72 per cent of activity in that country's mandatory scheme was undertaken by energy service companies.[10] In its submission to the Task Group, the Energy Efficiency Council cited work by the Australian Council of Trade Unions and the Australian Conservation Foundation, which found that:

> [I]f Australia immediately introduced policies to grow the domestic market for energy efficiency it could capture 5 per cent of the global market, potentially creating 75,000 jobs in energy efficiency by 2030.
>
> Energy Efficiency Council submission to the Task Group[11]

At present, New South Wales, Victoria and South Australia have legislated energy efficiency obligations. These schemes all operate differently. They have different rules, sectoral coverage, targets and underlying objectives. Together they cover around 65 per cent of Australia's population,[12] 65 per cent of small customers,[13] and 13.7 per cent of final energy.[14] All three place obligations on energy retailers, and 18 out of Australia's 26 small customer retailers operate in one or more these three markets.[15]

Submissions to the Task Group that commented on energy efficiency obligations called for the establishment of a single national scheme, both to drive further take-up of energy efficiency opportunities, and to reduce the regulatory burden on energy retailers.

AGL Energy commented:

> Whilst each of [the state] schemes in isolation have addressed a number of barriers to energy efficiency in the residential sector, by virtue of being multiple obligations interfacing with the singular wholesale market, they are not benefiting from the potential economies of scale achievable by a singular, nationally consistent scheme. Slightly different rules and features increase complexity and consequently make it administratively more difficult and costly for scheme participants.
>
> AGL Energy submission to the Task Group

The Energy Retailers Association of Australia noted:

> The current situation of inconsistent state based white certificate schemes is inefficient. In each of the three state based schemes there is excessive compliance burden, high transaction costs, varying objectives, and insufficient time, notice and consultation prior to commencement of the schemes. White certificate schemes are not the preferred policy option for retailers, but there could be benefit in introducing a nationally consistent and more efficient scheme, as opposed to having three, or potentially more, different schemes operating.
>
> Energy Retailers Association of Australia submission to the Task Group

An energy efficiency obligation is attractive because it drives least-cost energy efficiency, minimising the costs of meeting the obligation. Energy efficiency opportunities and their marginal costs vary across economic sectors and geographic regions. Because obligations allow those meeting the obligation to decide how they will meet it (within the rules), investment will tend to migrate towards low-cost efficiency opportunities, as long as the scope of the obligation is broad and encompasses opportunity-rich sectors and regions.

This should result in lower costs to the economy as a whole[16] and (typically) lower fiscal costs.[17] However, it should be noted that the cost of meeting the obligation is not zero, and will be passed through to the broader economy, where it may accrue unevenly. Similarly, there will be fiscal costs associated with effective measurement and verification as part of regulating an obligation if it is to achieve the desired outcomes.[18]

While an energy efficiency obligation will effectively complement a carbon price and drive greater take-up of energy efficiency opportunities, it is not a panacea capable of removing all the barriers to exploiting the energy efficiency resource. As

the Productivity Commission noted in its 2005 report, *The private cost effectiveness of energy efficiency*,[19] a mandatory obligation alone cannot adequately address some significant market failures, such as lack of information and the positive externalities associated with research, development and demonstration projects.[20]

An energy efficiency obligation 'would need to be complemented and supported by other policy actions aimed at overcoming the obstacles to the development of a market for energy efficiency products and services, such as:

- information campaigns
- energy labelling and minimum energy efficiency requirements
- market studies and statistics to help identify the technological baseline.'[21]

Garnaut noted challenges in establishing the quantum of energy savings in a mandatory obligation, and further, for an obligation placed on energy retailers, 'problems in requiring that [they] undertake activities to improve energy efficiency when their primary incentive is to sell more energy'.[22] Issues around aligning the National Energy Market with incentives to improve energy efficiency are discussed in chapter 12.

Some submissions to the Task Group, such as those from TRUenergy and the Electricity Supply Association of Australia, expressed concern that a mandatory obligation would reduce the effectiveness of the CPRS. The Task Group terms of reference required that energy efficiency mechanisms recommended by the Task Group complement the CPRS and the Renewable Energy Target, in line with the Council of Australian Governments' complementarity principles (see Appendix A). A discussion of carbon price incentives and energy efficiency is in Box 4.3.

Box 4.3 Early action on energy efficiency and incentives under a carbon price

The measures outlined in this report will not 'undo' the effects of a future broad-based carbon price, but rather will provide an effective complement. It is important to remember that a broad-based carbon price is not an end in itself; it is a means to reducing our national emissions, an outcome which the Government has stated is squarely in Australia's national interest.

Regardless of what other energy efficiency incentives and policies are introduced beforehand, a future broad-based carbon price will still provide an incentive to reduce emissions. Under such a price, each unit of emissions produced by a liable party still has an opportunity cost, so parties retain an incentive to reduce their emissions even if previous energy efficiency improvements have reduced their overall liability.

For parties not directly liable under a future broad-based carbon price, prior actions to improve energy efficiency will reduce any cost increases they may face once emissions are priced. For example, households could reduce their current and future electricity bills by taking advantage of offers leveraged by an energy savings initiative or incentives offered through other policies and programs.

Overall, emissions reductions (including those made through improvements in energy efficiency) before the introduction of a broad-based carbon price are desirable because they prepare households and businesses for carbon pricing. Earlier actions also help Australia to lower the overall costs of meeting a given emissions reduction target. Introducing energy efficiency measures ahead of a carbon price will therefore not 'undo' the effects of a broad-based carbon price, rather it will help Australians prepare for its arrival.

4.4 Existing state-based schemes

As noted above, three states currently have energy efficiency obligations. Energy efficiency savings achieved by schemes in New South Wales and Victoria are shown in Table 4.1.

Table 4.1 Achievements of state-based schemes

State	Scheme	Start date	Achievements[a]
New South Wales	Greenhouse Gas Reduction Scheme (GGAS) Demand Side Abatement Rule[b]	1 January 2003	30.3 Mt CO_2-e
	Energy Savings Scheme (ESS)	1 July 2009	0.39 Mt CO_2-e
Victoria	Energy Saver Incentive	1 January 2009[c]	5.04 Mt CO_2-e
Total			35.73 Mt CO_2-e

a To date, as at 4 June 2010.

b The NSW GGAS included a Demand Side Abatement Rule, which allowed certificates to be created for energy efficiency. Numbers shown here are for that rule only. The rule was turned into the ESS from 1 July 2009.

c The South Australian Residential Energy Efficiency Scheme also commenced on 1 January 2009; however, results from the first year of operation were not available at the time of writing.

Sources: New South Wales—NSW ESS/GGAS registry, www.ggas-registry.nsw.gov.au, accessed 4 June 2010. Victoria—Personal communication with Mr Ralph Griffiths, Energy Services Commission of Victoria, 4 June 2010.

New South Wales Energy Saving Scheme

The NSW Energy Savings Scheme (ESS) commenced on 1 July 2009, and replaced the end-use energy efficiency component of the Demand Side Abatement Rule under the NSW Greenhouse Gas Reduction Scheme, which commenced in 2003. The overall ESS target starts from 0.4 per cent of total annual NSW electricity sales and increases to 4 per cent over four and a half years, remaining at that level until 2020 or until a national energy efficiency scheme is established. It applies to electricity retailers and a small group of wholesale market customers and electricity generators that supply directly to retail customers.

Obligated parties meet their energy savings target by obtaining and surrendering tradeable Energy Saving Certificates, which are created by undertaking activities that improve energy efficiency in the residential, commercial and industrial sectors. They can undertake these activities themselves, or pay another Accredited Certificate Provider (for example, an energy service company) to do it for them. The penalty under the scheme for the 2009 compliance year is $24.50 per megawatt hour.

Victorian Energy Saver Incentive

The Energy Saver Incentive commenced on 1 January 2009 and sets a target for energy savings in the residential sector equivalent to 2.7 Mt CO_2-e per year for the years 2009 to 2011. It requires retailers of electricity and gas with more than 5,000 customers in Victoria to meet their individual share of the target by surrendering tradeable Victorian Energy Efficiency Certificates, which represent savings from prescribed activities.

Certificates can be created by accredited persons for changes to water heating, space heating, space conditioning (windows and draught seals), low-energy lighting, low-flow shower heads, and high-efficiency refrigerators and freezers.

The penalty rate for the 2009 compliance year is $40/t CO_2-e. The scheme operates in three-year phases, with the current phase ending on 31 December 2011.

The Victorian Premier announced on 15 July 2010 that Victoria will be moving to double the Energy Saver Incentive target to 5.4Mt CO_2-e per year, expanding the list of approved activities, and expanding the scheme to apply to small- and medium-sized businesses.

South Australian Residential Energy Efficiency Scheme

The Residential Energy Efficiency Scheme (REES) was introduced on 1 January 2009. Electricity and gas providers with more than 5,000 customers in South Australia are required to meet targets to improve household energy efficiency. It runs in three-year phases, and the target in 2009 was 155,000 t CO_2-e (35 per cent of which was to be achieved in low-income households).

Obligated parties (and their contractors) are required to offer incentives for householders to adopt energy-saving measures, such as installing efficient lighting, showerheads, heating and cooling systems, ceiling insulation, draught proofing and retiring second refrigerators and freezers. Each energy-saving measure has a set of minimum requirements with which energy providers and their contractors must comply. Energy savings are not represented by tradeable certificates.

The scheme has an additional requirement that energy providers must deliver energy audits to 13,000 low-income households over the next three years (2009 to 2011), as a priority. Energy providers and their contractors must comply with minimum requirements in delivering energy audits.

The REES penalty amounts comprise a base penalty amount of $10,000, a shortfall penalty of $500 per energy audit not achieved and a 'make good' provision, and a shortfall penalty for the greenhouse gas reduction target of $70 per t CO_2-e.

4.5 International precedents

Energy efficiency obligations are currently in place in the United Kingdom, France, Italy, and some states of the United States. They are also under consideration in several other countries, including jurisdictions with a carbon price already in place.

United Kingdom: Carbon Emissions Reduction Target

The UK's Carbon Emissions Reduction Target (CERT) requires energy suppliers to meet ambitious household carbon saving targets of 185 Mt CO_2-e over the period 2008 to 2011. The CERT followed on from the Energy Efficiency Commitment (EEC), which began in 2002 as EEC1 and was modified to become EEC2.

Suppliers of gas and electricity are required to meet specified targets by promoting the take-up of energy-saving measures. Suppliers must install a combination of eligible measures that have a lifetime carbon saving score equal to their target.

The regulator defines standard energy efficiency measures acceptable for fulfilling the target and quantifies the energy savings of these measures. Eligible measures include behavioural measures such as real-time energy consumption display devices and home energy advice.

The CERT does not provide tradeable certificates; however, flexibility is offered in that energy savings and individual obligations may be traded with the regulator's approval.

The UK Government argues that household energy programs are among the most cost-effective measures available to reduce national emissions, as the financial savings per tonne of carbon saved are greater than in other sectors. The CERT is limited to household measures and has a specific requirement to realise at least 40 per cent of the carbon saving obligation in a priority group of low-income, vulnerable and elderly households. The CERT works in tandem with another measure, the Decent Homes Standard, which requires all social housing to achieve a minimum standard of wind- and weatherproofing, warmth and modern facilities.

Evaluation of the CERT's predecessor, the EEC1, identified that much of the target was met through home insulation.[23]

Participants in EEC2 identified branding and customer loyalty as significant co-benefits of non-trading.[24] As the website of E.ON, a major UK energy retailer, states:

> We're an energy company. Our business is selling energy. The more energy people use, the more money we make, surely?
>
> Except, for a forward-looking energy company with an eye on more than short-term profit, it doesn't. Our ideal would be to have more customers. All using less energy.[25]

Our ideal would be to have more customers. All using less energy.[25]

Analysis of EEC1 for the period 2002 to 2005 found that 'energy suppliers have met their targets with an expenditure of 20 per cent less than the [UK] Government expected'.[26] When costs to all parties were taken into account, it was estimated that the cost to the UK economy of saving one kilowatt hour of electricity through EEC1 was 1.3 pence, compared to the cost to the consumer of purchasing one kilowatt hour at that time of 6.7 pence.[27]

France: Energy Efficiency Obligation

Introduced in 2006, the Energy Efficiency Obligation requires suppliers of electricity, gas and heating fuel to contribute to meeting a target of 54 terawatt hours across the period 2006 to 2009, with obligations proportional to their share of total sales. Energy efficiency certificates can be created by suppliers, other companies, and local public authorities, in respect of energy efficiency activities in all sectors (excluding those whose emissions are covered by the European Union's emissions trading scheme).

There are 180 standardised activities with deemed savings. The penalty in 2006–2009 was €2.00 per kilowatt hour. Certificates can be traded.

During the first three years of the obligation, energy suppliers were the most active participants in the scheme, and mostly carried out activities with their own customers. An average price of 0.32 euro cents per kilowatt hour was observed (well below the penalty), noting that during the same period, a tax credit was available for many items of eligible equipment, which is estimated to have covered about 25 per cent of the capital cost of equipment. Little trading occurred because of strong participation from obligated parties (which in France are local monopolies, the largest of which is state-owned).[28]

Proposals for the second phase of the Energy Efficiency Obligation include extending fuel coverage to transport fuels and deeming activities for public transport, trains, freight and passenger vehicles; a much larger target (approximately a six-fold increase); reducing administrative complexity by limiting the groups that can create certificates; and establishing a quota or bonus for activities in the poorest households.

Italy: White Certificate Scheme

The Italian White Certificate Scheme began on 1 January 2005. It places obligations on distributors of gas and electricity to meet a target. Annual targets began at 0.1 megatonnes of oil equivalent (Mtoe) in 2005, and rose to 1.8 Mtoe for electricity and 1.4 Mtoe for gas in 2009.

Distributors must achieve half their target with their own customers. They can also develop projects jointly with third parties, or buy certificates in the market. Engineering calculations, monitoring and metering are used to create certificates, and some items of equipment also attract a standardised number of certificates. Obligated parties were also allowed to retrospectively claim activities implemented from 2001 onwards, and it is estimated that (to 2007) about 60 per cent of activity came from retrospective claims.[29]

The Italian White Certificate Scheme was successful in creating a strong market for energy service companies. It was estimated in 2008 that 72 per cent of certificates were created by these companies.[30] However, most certificates (78 per cent) made their way to distributors via bilateral trades, rather than through the open market.[31] It may be relevant in this respect that the Italian gas and electricity markets are dominated by two large companies, with one distributor being responsible for around 90 per cent of the electricity target, and another being responsible for more than 30 per cent of the gas target.[32]

The scheme does not have a penalty directly related to the amount by which a distributor falls short of its target. The scheme regulator makes an allowance in the distribution price formula for the cost to distributors of acquiring certificates. In the first phase, this was €100 per certificate;[33] between 2006 and 2007, the mean traded prices were €56.30/Mtoe for electricity and €86.50/Mtoe for gas.[34] This would imply that on average distributors make a profit from the scheme. Nevertheless, Mundaca et al. estimated savings for end users (between 2006 and 2007) of between €0.05 and €0.06 per kilowatt hour of electricity and gas saved.[35]

The Task Group recommends that the Government undertake further analysis of the options for implementing an energy efficiency obligation… it would be premature to recommend a measure of this scope without a comprehensive consultation process, detailed modelling and costing.

4.6 Options for delivering a step change through an energy savings initiative

The Task Group recommends that the Government undertake further analysis of the options for implementing an energy efficiency obligation (referred to as the 'energy savings initiative') using a market-based mechanism with the headline objective of 'making the use of energy more efficient across the economy'.

A national energy savings initiative would be designed to:

- increase the energy productivity of the Australian economy and performance of Australian firms compared to international competitors
- drive a step change in energy efficiency improvement
- prepare the economy for the impacts of a carbon price, by:
  - improving the ability of the economy to respond to the carbon price signal
  - ensuring that energy bills rise less than energy prices
- address observed market failures such as improving knowledge and take-up of energy efficiency opportunities.

In a submission to the Task Group, the Energy Retailers Association of Australia noted that:

> [T]here needs to be a detailed cost–benefit analysis to identify whether the benefits from a national white certificate scheme would outweigh the costs. Even if there is demonstrable net benefit (including all market and

policy related costs), good policy making demands that alternative policy options are considered to see if they deliver even greater net benefits.

Energy Retailers Association of Australia submission to the Task Group

The Task Group agrees with this view. It would be premature to recommend a measure of this scope without a comprehensive consultation process, detailed modelling and costing, and a regulatory impact assessment. Given the number of design parameters which would require careful deliberation and analysis, it would be highly desirable to develop options for consideration by the Government after close consultation with industry and community groups, and the states and territories, if the objective is to create a single national scheme to replace existing state systems.

In this report, the Task Group presents a set of principles that can be used to guide the policy development process (Table 4.2) and a discussion of some of the issues that will need to be explored as part of a future work program.

Table 4.2 Principles for a well-designed national energy savings initiative

Principle	Intent
1 A least-cost approach	The final design should represent the most cost-effective option that meets principles 2–7 below, where cost-effectiveness should be calculated as the cost to the economy as a whole,[a] and after taking account of appropriate sharing of risk among participants, energy users and government.
2 Driving a step change	The design should assist in delivering the Task Group's stated objective of a step change in energy efficiency performance by contributing substantially to the achievement of a national energy efficiency improvement target.
3 Simplicity and transparency	An energy savings initiative should be easy for participants and the public to understand. The costs and benefits from it should be clearly visible to all. Administration and compliance should not include needless complexity.
4 National consistency	A national energy savings initiative should have the same rules in each state and territory and facilitate cross-border transactions.
5 Fair and equitable	Where an energy savings initiative imposes additional costs on energy end users, these should be borne as equitably as possible. Where an energy savings initiative is the most appropriate way to deliver assistance to disadvantaged and low-income households and community organisations it should be designed to do so, with other options developed to ameliorate cost impacts as appropriate.
6 Maximum coverage of end use	The maximum possible amount of stationary final energy should be counted in setting and meeting the mandatory obligation. Exclusions and offsets should be minimised.
7 Complementary with an explicit phase-down strategy	An energy savings initiative would prepare the economy for a carbon price by improving energy efficiency, addressing energy efficiency barriers and helping the economy to respond more effectively once a carbon price is present. Achieving maximum energy efficiency will require a mature carbon price. An appropriate phase-down strategy linked to an effectively functioning mature carbon price should be considered in the design.

a. Waide and Buchner note that 'least-cost investment by companies to reach their energy savings [target] is unlikely to correspond to the least-cost outcome for society, as companies usually do not take into account the barriers that exist for consumers to benefit from these investments'. P Waide & B Buchner, 'Utility energy efficiency schemes: savings obligations and trading', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 309.

Box 4.4 How an energy savings initiative would interact with an aspirational national energy efficiency target

As outlined in chapter 3, the Task Group proposes that Australia set a national energy efficiency target of a 30 per cent improvement in primary energy intensity over the period 2010 to 2020. This target will relate Australia's economic output (measured by GDP) and energy production (primary energy), and is measured in gigajoules of energy produced per thousand dollars of GDP (GJ/$'000). As such, it covers both energy consumed by end users and that used in the creation and distribution of energy to end users. Importantly, the aspirational energy efficiency target is not the same as the mandatory obligation set through the energy savings initiative.

The mandatory obligation for an energy savings initiative would be measured against final energy, that is, energy consumed, and would be measured in units of energy (gigajoules or gigawatt hours).

The energy savings initiative's mandatory obligation could achieve a proportion of the national energy efficiency target but not all of it. It would reduce final energy consumption across the economy, which (other things being equal) would reduce primary energy use.

In order to ensure that an energy savings initiative does not reduce GDP (and therefore work against the national target), rules for claiming credit towards the energy savings initiative's mandatory obligation would need to include a proviso that no credit can be awarded for a reduction in output.

For example, if a factory producing shoes decommissioned one of its production lines, this would reduce the energy consumed at the factory. But it would also reduce the factory's output — fewer shoes would be made. An energy savings initiative therefore should not award credit for this. However, if the factory retooled the production line so that it made more shoes using the same amount of energy or made the same number of shoes using less energy, then credit could be awarded.

Barriers addressed

The most significant barriers where an energy savings initiative could make a large difference are in improving materiality and inadequate returns, by making it more worthwhile to seek out and implement energy efficiency improvements. An energy savings initiative would also make a contribution towards improving prioritisation and access to finance, reduce split incentives, and potentially also create a demand for skills. These effects are explored further in Table 4.3. In-depth discussion of barriers to energy efficiency can be found in chapter 2.

An energy savings initiative could also make a contribution to removing information barriers. In its submission to the Task Group, Origin Energy noted that 'retailers play an essential role in providing information to consumers' and called on the Government to 'leverage retailers' great potential to address information barriers for end users' through 'a long term, well designed and well funded national knowledge transfer programme'.

The benefits and costs of using an energy savings initiative to reduce information barriers could be further explored as part of the development process and would need to complement rather than duplicate the broader national strategy to create an energy efficiency culture (see chapter 7).

Table 4.3 Energy efficiency barriers and an energy savings initiative

Barrier	How an energy savings initiative would help
Materiality	Encourages take-up of small projects that currently languish by aggregators or companies—third parties that can become expert in implementing small projects, and gathering these together into a large enough saving to be of interest to a liable party.
Inadequate returns	Improves the return on some energy efficiency projects by creating a revenue stream in addition to the energy savings made (that is, an obligated party will be willing to pay for the right to count those savings towards its obligation).
Prioritisation	Improves the return on some projects, therefore bringing forward projects whose investment returns are not currently attractive enough to make them a priority. May also assist by helping develop a market for third-party providers of energy-efficient services, who can help prioritise projects by reducing the 'hassle factor' for energy users.
Access to finance	By making investment returns more attractive, it may make it easier to attract finance. May also encourage the growth of energy performance contracting in the Australian market.
Split incentives	Provides a split benefit for energy efficiency — for example, a tenant can enjoy the bill reductions, and the landlord can benefit from an obligated party paying them for the right to count those savings towards their obligation.
Skills	Helps develop skills in implementing energy efficiency projects by growing the market. Helps develop expertise in costing, pricing and managing energy efficiency projects in the industrial sector.

Factors affecting the design of an energy savings initiative

Were the Government to proceed with consulting on, developing, designing and implementing an energy savings initiative, a number of choices would be required. Factors that affect these decisions are discussed in depth in Appendix L.

Some of the simpler choices include:

- whether to use a baseline-and-credit framework or a cap-and-trade framework
- whether to measure the obligation against primary energy or final energy
- whether to measure the obligation as a percentage or as an absolute amount of energy.

A number of other design elements will need to be considered in the context of the principles outlined in Table 4.2. These are summarised in Table 4.4. For each of the parameters for the initiative, the design elements shown in the table are not either/or choices, but rather points along a spectrum from basic (on the left-hand side) to ambitious (on the right-hand side).

Decisions about one element may also affect decisions about others. For example, deciding that gas should be included as a covered fuel would imply consideration of making retailers and large users of gas obligated parties.

It should not be assumed that choosing design elements from the basic side of the spectrum will result in a lower-cost scheme. On the contrary, the broader the base of the scheme, the more least-cost energy efficiency opportunities it is likely to capture, although this would also add complexity. Selecting where to land on the spectrum of options available will involve a trade-off between maximising the opportunities available to save energy and minimising the costs to all parties involved.

Table 4.4 Design elements for an energy savings initiative

Element	Spectrum of options available					
	BASIC ←					→ AMBITIOUS
What fuels are covered?	Electricity	Plus gas (for stationary energy)	Plus other fuels for stationary energy	Plus diesel, petrol and gas for transport	Plus all other fuels	
Who must meet the obligation?	Retailers or distributors of electricity	Plus large users of electricity	Plus retailers or distributors of gas	Plus large users of gas	Plus large users of other fuels	Plus distributors of transport fuels
Sectors where activities can take place	Households	Plus industrial	Plus commercial buildings	Plus electricity generators	Plus electricity networks	Plus commercial transport	Plus all transport
Size of the obligation	Low (for example, 1% of final energy)			Moderate (for example, 5% of final energy)		Ambitious (for example 10% of final energy)
Trading	No trading at all			Bilateral trading		Full trading through a centralised exchange
Allowable energy savings	Deemed savings from standardised consumer products			A mix of deemed savings and measured savings		Only activities that can prove savings against a historical baseline
Additionality	All energy efficiency improvements, with no requirement to prove that it goes beyond business as usual			Improvements that are beyond business as usual		Only improvements that represent best practice

Note: Design elements are presented as forming a spectrum from left to right. The most basic option is on the left-hand side. Adding more elements by moving from left to right would make a scheme more ambitious. For example, looking at the fuel coverage row, the most basic scheme would only cover electricity; the most comprehensive would cover electricity, gas, all other stationary energy fuels, transport fuels and all other fuels.

Sub-obligations, exclusions and areas of special focus

A sub-obligation would mean reserving part of the mandatory obligation in an energy savings initiative, and prescribing that this sub-obligation must be met in a specific sector or by a specific group. For example, the Government could decide that part of the obligation must be met by improving the energy efficiency of commercial buildings or existing housing stock, or that a certain amount of activity must take place in each state.

In general, the presence of sub-obligations in a mandatory obligation makes achievement of least-cost energy efficiency less likely, because the sub-obligations will prevent some portion of the overall mandatory obligation moving towards least-cost opportunities. Sub-obligations also increase complexity in participation, administration and compliance.

'[T]he integrity and effectiveness of a mandatory energy saving target relies critically on how ambitious the target is.'[36]

The decision to set a sub-obligation should involve careful consideration of the energy efficiency outcome that is desired in the sector and whether a special sub-obligation is the best way to achieve it. For example, experience in the United Kingdom, where activity is mandated in disadvantaged households, suggests that the UK retailer obligation as currently designed is not the most cost-effective way to achieve the whole-of-house retrofits required to significantly assist disadvantaged households. This is because it delivers only piecemeal interventions, rather than encouraging an approach of visiting a house once and refitting it with a number of technologies.

In the same vein, the Government could also design an energy savings initiative to reduce cost impacts on a sector by removing that sector's energy demand from the obligation. For example, the Government could exclude energy used in a certain industry when calculating the obligation; or it could exclude regions not connected to a main electricity grid. In this case, it would be important to consider:

- the relative costs borne by excluded groups compared to the benefits to them, and to the economy as a whole
- preserving incentives for all sectors of the economy to improve energy efficiency, and incentives and obligations to exploit energy efficiency opportunities delivered by other policies
- the effects on the size of the mandatory obligation. The level of ambition of the obligation will be critical to success.[37] Reducing the base against which the obligation is calculated will either lead to a lower obligation (in order to keep costs reasonable for those sectors that form the base), or require sectors that form the base to do more to compensate for those excluded (which may force higher-cost actions to be undertaken in the covered sector).

Relationship to other energy efficiency policies and measures

Implementing an energy savings initiative would require careful and extensive consideration of other energy efficiency policies and measures through consultation, design and implementation.

Implementing other policies that favour a particular energy efficiency activity could prevent an energy savings initiative from delivering least-cost energy efficiency by driving activity in a higher-cost sector that is also claimable as credit towards meeting the mandatory obligation. Managing this would require sufficient flexibility to respond to new circumstances and require governments at all levels to be mindful of the effects of new policies on an energy savings initiative.

For example, the Victorian Energy Savings Scheme made ceiling insulation ineligible for Victorian Energy Savings Certificates for the period during which the Commonwealth's Home Insulation Program was in place.

Conversely, new Commonwealth policies that fund energy efficiency activity should consider the likely financial benefit that new activities could gain from an energy savings initiative before determining appropriate levels of funding. Further discussion of how other energy efficiency policies complement an energy savings initiative is in Box 4.5.

Box 4.5 Relationships between energy efficiency policies

This box summarises the work of Child et al., who have analysed the interaction between tradeable energy efficiency certificate schemes and other energy efficiency policy measures in the European context.[38]

- Building energy certification raises awareness of the potential of energy savings in buildings, while a mandatory energy efficiency obligation can provide a mechanism to finance these measures. Information sharing and common databases are also possible. Additionality requires further investigation.
- Subsidies and tax incentives can be considered to harmonise with a tradeable energy efficiency scheme where they go above and beyond the extent of activities stimulated by the scheme. However, in structuring subsidies and tax incentives, allowances must be made for the financial incentive provided by the mandatory obligation, and care taken to prevent 'double-dipping'.
- Performance standards and appliance labelling achieve some of the lowest-cost energy efficiency improvements, as well as measuring and verifying performance compared to the average. As long as mandatory energy efficiency obligations have an additionality requirement and only reward above-average performance, performance standards can happily co-exist with a tradeable energy efficiency scheme in a similar way to building energy certification.
- Energy performance contracts should only be considered eligible for credit under a mandatory obligation if these agreements are not linked to subsidies or tax breaks—that is, they are genuinely additional activity.
- Information, education and audits should help lower the transaction costs for a mandatory obligation.

4.7 Expected outcomes for end users

An energy savings initiative would create some common outcomes for all end users of energy. It would deliver better returns for energy efficiency projects by creating a second benefit or 'reward' for each unit of energy efficiency that can be sold to someone else, creating an additional source of revenue (see Box 4.1). These better returns would bring forward energy efficiency improvement projects (and associated savings) that currently have longer paybacks—although the extent to which this occurs would be influenced by the ambition of the mandatory obligation set under an national energy savings initiative.

Stimulating more energy efficiency activity would also build expertise and capability in costing, pricing and managing energy efficiency improvement projects—it would grow Australia's energy services market. The development of Australia's energy services sector will also be important in smoothing the transition to a mature carbon price.

An energy savings initiative could also affect energy prices, by causing them to either rise or fall. The costs of higher energy prices, or the benefits of lower prices, would be felt across the economy. Initial modelling suggests a national scheme could be structured so that it does not increase energy prices (see Box 4.6).

An energy savings initiative would also place some compliance burden on obligated parties. The extent of this would depend on the design and the point of obligation. For parties that are already complying with more than one state-based

energy efficiency scheme, a single national scheme is likely to reduce their overall compliance burden.

To demonstrate how a national energy savings initiative might work in practice, the Task Group commissioned illustrative modelling of three 'without prejudice' theoretical scenarios. A summary of the results is in Box 4.6 and the full results are in Appendix F. It must be emphasised that these scenarios are purely illustrative, and are presented here to provide some initial understanding of costs and benefits. The parameters and assumptions used do not form part of the Task Group's recommendations.

Box 4.6 A national energy savings initiative — illustrative modelling

As an example of the likely scope and achievements of a national energy savings initiative, the Task Group commissioned preliminary analysis of a hypothetical national energy savings initiative. The details of this analysis, including the assumptions made, can be found in Appendix F.

Illustrative analysis of a national energy savings initiative covering gas and electricity and all customer types suggests that, when compared to business as usual, Australia can achieve significant energy efficiency at very low cost and that power bills could be constrained below what would otherwise be the case — that is, energy bills could rise by less than is currently projected.

This illustrative analysis implies overall lower growth in total energy use compared with business as usual (total electricity and gas use are estimated to be reduced by up to 7 per cent each, in 2020).

The analysis also estimated that peak electricity demand is reduced by up to 1,400 megawatts in 2020. Investment in new electricity generators, transmission networks and gas infrastructure and operating and maintenance costs are also deferred (total savings are estimated at up to around $12 billion by 2040).

Households and businesses are expected to benefit through a reduction in the rate of increase of electricity bills. The illustrative analysis estimates that all households would benefit by around $87 to $180 in 2020. For those households that implement energy savings measures the benefits would be even larger. Homes would be more comfortable and use less energy and the combination of lower energy use and lower electricity prices would mean even larger bill savings — on average, for a household implementing two energy savings technologies, there could be annual saving of up to $296 in 2020 when compared with business as usual. However, while demand for gas falls as a result of the energy savings initiative, retail gas tariffs are estimated to increase by up to around 2 per cent in 2020. This is because the wholesale gas price is largely driven by international factors and demand for gas as a fuel in electricity generation. Consequently, there is no corresponding fall in wholesale gas prices to counter the increase in retail gas compliance costs.

Electricity generation could also become less fuel and emissions intensive (the amount of fuel required to produce electricity and the amount of emissions released from its production) due the combination of lower growth in electricity demand and additional renewable energy brought on by the Government's Renewable Energy Target.

The replacement of multiple state-based schemes with a single national energy savings initiative could also reduce costs for retailers and governments.

While the illustrative analysis results need to be treated with great caution, they do provide a strong case for further detailed consultation, analysis and comprehensive modelling of a national energy savings initiative.

Households

The biggest impact for households would be energy efficiency improvements in existing homes. If a whole-house retrofit approach were used, an energy savings initiative would make a noticeable difference to energy bills for individual households.

An energy savings initiative would also benefit firms whose business is retrofitting homes for better energy efficiency—an essential requirement for a low-carbon economy, and a significant step in making energy efficiency at home easy to access and relatively hassle free.

In rental properties (one-third of Australian homes), an energy savings initiative could help to reduce the split incentive barrier by creating two benefits for each unit of energy efficiency—the tenant would enjoy the savings on the bill, and the landlord could sell the credit generated under the scheme.

The Government could also explore options for ring-fencing part of the mandatory obligation so that activity took place in low-income households and community organisations, as a way of recognising that energy price rises disproportionately affect these households.

Typical activities that might be stimulated in households include draught sealing, high-efficiency lighting, high-efficiency appliances, insulation, more efficient forms of space heating and cooling, and more efficient water heaters.

Box 4.7 Cost impacts of an energy savings initiative on low-income households

As shown in Table 4.4, either retailers or distributors of electricity and/or gas could be required to meet part of a mandatory obligation set through an energy savings initiative. It would be expected that whichever party is liable would pass through to its customers the cost of activities to meet the obligation. As outlined in Box 4.6, initial illustrative modelling indicates that energy bills may be reduced. However, this modelling is only an illustrative exercise. Were an energy savings initiative to be implemented, further modelling would need to be carried out to compare costs and benefits on a more detailed design.

Low-income households pay proportionally more of their income towards energy costs.[39] An extra cost, while appearing small in absolute terms, can therefore have a disproportionate impact on a low-income household budget. If the Government decided to implement an energy savings initiative, and further modelling showed that costs to low-income households were material, it would need to consider how these impacts might be ameliorated.

One way would be to set the mandatory obligation so that the pass-through cost was considered immaterial to all households. Indeed, initial modelling suggests that it is possible to set a reasonably ambitious obligation and keep costs low. However, a balance would need to be struck between keeping pass-through costs low and achieving the goal of making a step change in Australia's energy efficiency improvement.

A second option would be to compensate low-income households through the tax and payments system, proportional to the estimated pass-through costs of an energy savings initiative. This approach was proposed for the CPRS, noting that the CPRS was estimated to cost households between $4 and $5 a week extra in electricity costs before compensation, compared to savings of up to $180 per year under the illustrative modelling of an energy savings initiative. Fiscal risks would arise, however, if there is a chance that the cost of meeting the obligation was much less than estimated (as happened in the United Kingdom — see section 4.5), or much more. If it was decided that compensation was warranted, consideration could also be given to meeting the

costs off-budget or from some form of special purpose levy on other consumers. The implications of both approaches would need to be carefully thought through.

A third option would be to provide a rebate on actual pass-through costs. This would require energy retailers to itemise the pass-through cost on the bill, and the householder to claim all or part of it back. This would better match actual pass-through costs to compensation. However, it would require the householder to bear the cost first and then be compensated in retrospect. This could be difficult for some households. A rebate might also reduce incentives for households to reduce energy use. Again, any such proposal would require further careful consideration.

A fourth option would be to set a sub-obligation within an energy savings initiative for activities that reduce energy consumption in low-income households. This would provide some permanent protection against all energy price rises for these households (not just any that may be associated with the national energy savings initiative), as well as associated co-benefits such as improved health and comfort. However, it is possible that some households would miss out but still face the pass-through costs. Further discussion of the advantages and hazards of sub-obligations can be found above in section 4.6.

In considering these options, it should also be noted that, unlike the CPRS and a public benefits charge (discussed in Appendix G), an energy savings initiative would not raise revenue for the Government. As a result, any compensation for low-income households (or indeed, any other group) would need to be raised by reprioritising existing government expenditure or by raising revenue elsewhere.

Small and medium businesses

Small and medium businesses often have similar energy profiles to households, and so many of the benefits outlined above would also accrue in this sector.

An energy savings initiative would also create demand for businesses that sell and retrofit energy-efficient products and services, particularly in the home building and renovation sector. This would create opportunities for new and expanded small and medium businesses.

Because of the wide range of activities that small and medium businesses carry out, the range of activities that might be stimulated by an energy savings initiative is similarly broad. Some examples might include more efficient refrigeration, heating and cooling, new water heaters, boilers and motors, better lighting, and new tools and equipment.

Commercial building owners and tenants

An energy savings initiative would help to overcome the split incentive barrier that currently plagues attempts to achieve significant energy efficiency improvements in commercial buildings. It would create two benefits for each unit of energy efficiency: the tenant can enjoy the savings on the bill, and the landlord can sell credit generated by the scheme.

In addition, because it would award credit for activities that improve performance against a historical baseline, an energy savings initiative would create an incentive to improve existing building stock (noting that the building code only affects new buildings).

An energy savings initiative could leverage activities in commercial buildings such as upgrades based on the NABERS rating, improved management of heating, ventilation and cooling systems, better lighting and cogeneration.

Public institutions and community organisations

Public institutions and community organisations often have limited ability to pass on costs to those they serve, because they provide services at no or very low cost. A carbon price would therefore have an impact on the services provided by these groups because higher energy costs would probably mean cutting back on services.

An energy savings initiative would improve the payback on energy efficiency projects in public buildings such as universities, hospitals and other care facilities, helping them prepare for a carbon price.

Typical activities might include cogeneration facilities and boiler upgrades in hospitals, and better lighting and energy management in community facilities. As noted above for households, the Government could also explore ring-fencing part of the obligation to mandate activity in community sector facilities.

Industry and large users

Results from the Government's Energy Efficiency Opportunities program have shown that tangible savings could be made in projects that have paybacks of between three and five years.[40] An energy savings initiative would help improve the payback on some of these projects, making them more attractive for investment and helping industry to reduce its exposure to a carbon price by reducing energy consumption.

Some of the projects that might be leveraged include cogeneration, switching to more efficient motors and drives, improving thermal efficiency and capturing waste heat.

4.8 Implementation

Commonwealth legislation for a national energy savings initiative

A national energy savings initiative could be legislated by the Commonwealth Parliament with the Commonwealth relying on a number of constitutional powers. For instance, the corporations and external affairs powers could be used in conjunction to ensure the broadest possible participant coverage of the scheme (as was done in relation to the Carbon Pollution Reduction Scheme Bill).

Another option would be a Bill based on the taxation power, which would involve a different regulatory mechanism (similar to the *Renewable Energy (Electricity) Act 2000*). If the Commonwealth were to rely on the taxation power, it would need to carefully consider the transfer of risk between liable entities and third parties undertaking compliance actions.

A third option would be to pursue implementation through COAG. This could include COAG directing a new Australian Energy Commission (see chapter 5) to implement the measure within an agreed scope.

Pathway

As noted above, significant further design work is necessary before the Government could consider whether to proceed with implementation of an energy savings initiative. The next phase of work should build on the consultation process with business and other stakeholders already undertaken and draw strongly on the considerable work done by state governments and by other countries that have developed and implemented similar mandatory energy efficiency obligations.

Should the Government decide to pursue further work on the design and implementation considerations of an energy savings initiative, the pathway outlined in Table 4.5 shows how the implementation process might proceed.

Table 4.5 Implementation pathway for an energy savings initiative

Activity	Indicative timeframe
Develop policy proposal based on principles in Table 4.2 above, and model and cost	
Consultation with states	Ongoing
Public consultation process	End 2010
Draft legislation for consultation	Mid 2011
Energy savings initiative begins	1 July 2012

The Government may also wish to consider a pathway whereby an energy savings initiative commences as a voluntary initiative from 1 July 2011. Liable parties could gain credit for early action on energy efficiency while providing the Government and participants with opportunities to test measurement methodologies and compliance approaches.

Transition arrangements for existing state-based schemes

As noted above, three Australian states already have energy efficiency obligations, where the liable parties are the energy retailers. These schemes are all different to each other, meaning that a single national scheme is likely to be different to all three. Transition arrangements would need to be developed in close consultation with the states, for parties that are liable under the existing state schemes, and also for parties that are providing certificates and activity under the state schemes.

State schemes are either run in three-year phases (Victoria and South Australia) or have made specific provision for ending on the commencement of a national scheme (New South Wales). General principles to consider as part of the transition might be:

- providing early information to owners of projects that are accredited under state schemes to allow them to adjust their projects to continue to claim credit under a national energy savings initiative
- providing early information on activities that are currently eligible in state schemes but would not be included in a national energy savings initiative
- avoiding overlap of compliance periods between the national and state schemes.

Whether certificates or credits from state schemes would be fungible under a national energy savings initiative, and to what extent, would also require consideration.

Phase-down strategy

An energy savings initiative would be a complementary measure, but it is recognised that a mature carbon price is the better way to drive significant improvements in energy efficiency. An energy savings initiative should therefore be designed with a mechanism to phase down once a mature carbon price is expressed in the economy.

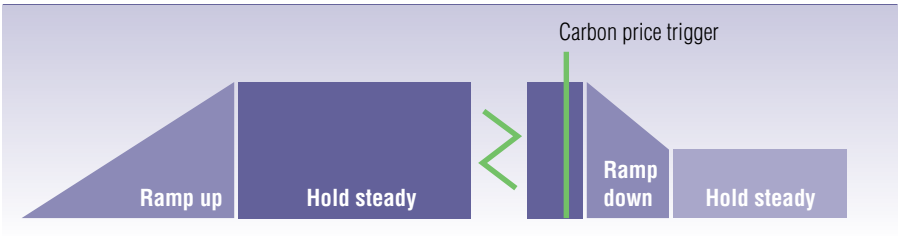
For some sectors, even with a mature carbon price in place, a smaller targeted obligation could continue to have a role in addressing sector-specific energy efficiency barriers. As noted in chapter 2, there are many barriers to improving energy efficiency that are unlikely to respond to a carbon price and which could hinder the effective operation of a carbon price. Where a continuing national

energy savings initiative is the best way to address these barriers in an economy with a mature carbon price, consideration should be given to allowing it to continue.

The simplest way to include a phase-down in the design would be to structure the trajectory such that it ramps up and then holds steady until reaching a trigger such as the beginning of a carbon price mechanism, or a certain carbon price. After the trigger point is reached, the trajectory would trend down to a lower (continuing) level.

Figure 4.1 illustrates an example of how this might work. The obligation ramps up from zero to its final percentage level over an initial period. It remains at this level until the trigger is reached and then starts to ramp down to a lower, continuing level.

Figure 4.1 Example of a obligation trajectory with a trigger



Notes

1 Commonwealth of Australia, *Australia's low pollution future: The economics of climate change* mitigation, 2008, p. 175.

2 Commonwealth of Australia, *Carbon Pollution Reduction Scheme Green Paper*, 2008, p. 26.

3 ClimateWorks Australia, *A low carbon growth plan for Australia*, 2010, p. 24.

4 International Energy Agency, *World energy outlook*, 2006, p. 195.

5 P Bertoldi & Silvia Rezessy, 'Tradeable white certificate schemes: Fundamental concepts', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 254.

6 PricewaterhouseCoopers, *Review of energy efficiency policy options for the residential and commercial building sectors*, report commissioned by the Energy Retailers Association of Australia, 2008, p. 48.

7 PricewaterhouseCoopers, p. 48.

8 Commonwealth of Australia, *Tracking to Kyoto and 2020: Australia's greenhouse emissions trends 1990 to 2008–2012 and 2020*, 2009, p. 19.

9 ClimateWorks, p. 25.

10 Bertoldi & Rezessy, p. 254.

11 Citing Australian Council of Trade Unions & Australian Conservation Foundation, *Green gold rush*, 2008.

12 Australia Bureau of Statistics, *Yearbook Australia 2009–10*, 2010, Table 7.3.

13 Australian Competition and Consumer Commission (ACCC), *State of the energy market*, 2009, p. 194.

14 Australian Bureau of Agricultural and Resource Economics (ABARE), *Australian energy statistics*, 2010.

15 ACCC, p. 194.

16 Bertoldi & Rezessy, p. 238.

17 N Eyre, 'Regulation of energy suppliers to save energy: Lessons from the UK debate', *Proceedings of the British Institute of Energy Economics Conference*, 2008.

18 S Meyers & S Kromer, 'Measurement and verification strategies for energy savings certificates: Meeting the challenge of an uncertain world', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 313–21.

19 Productivity Commission, *The private cost effectiveness of energy efficiency*, Commonwealth of Australia, 2005, p. 310.

20 It is worth noting that this report was published in 2005, before any significant exploration of a formal carbon price obligation and the likely impacts on the Australian economy. In its response at the time, the Government of the day agreed that the case for a national energy efficiency target had not been made.

21 M Pavan, 'Tradeable energy efficiency certificates: The Italian experience', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 265.

22 R Garnaut, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008, p. 411.

23 E Lees, *European experience of white certificates*, 'Country studies', p. 12, World Energy Council project on white certificates, 2007, www.worldenergy.org/documents/white_certificate.pdf, accessed 7 June 2010.

24 L Mundaca, L Neij, N Labanca, B Duplessis & L Pagliano, 'Market behaviour and the to-trade-or-not-to-trade dilemma in "tradeable white certificate" schemes', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 345.

25 www.eontalkingenergy.com, accessed 5 May 2010.

26 Lees, 'Synthesis report', p. 9.

27 Lees, 'Country studies', p. 13.

28 Information on the French Energy Efficiency Obligation was provided directly to the Task Group by the Agence de l'Environnement et de la Maîtrise de l'Energie (ADEME) of France. The Task Group is grateful to M Michel Hamelin, Deputy Director, International, and M Luc Bodineau, Energy Efficiency Certificates Manager, ADEME for their assistance; and to the Department of Foreign Affairs and Trade for assistance with liaison with ADEME.

29 Mundaca et al., p. 328.

30 Bertoldi & Rezessy, p. 254.

31 Pavan, p. 261.

32 Lees, 'Country studies', p. 6.

33 Lees, 'Country studies', p. 7.

34 Mundaca et al., p. 338.

35 Mundaca et al., p. 328.

36 Mundaca et al., p. 344.

37 Mundaca et al., pp. 342–3.

38 R Child, O Langniss, J Klink & D Gaudioso, 'Interactions of white certificates with other policy instruments in Europe', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 290–3.

39 S Hatfield-Dodds & R Denniss, *Energy affordability, living standards and emissions trading: Assessing the social impacts of achieving deep cuts in Australian greenhouse emissions. Report to The Climate Institute*, CSIRO Sustainable Ecosystems, Canberra, 2008.

40 Commonwealth of Australia, *First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program,* 2010, p. 24.

Governance

Coherence, accountability, focus and leadership are necessary to achieve a step change in energy efficiency performance. Only effective governance arrangements can deliver these. But governance arrangements are spread across ministerial councils and between government departments at all levels. If clear leadership is to be established, a ministerial council that can drive whole-of-government outcomes may be needed. If a coordinated approach is to be achieved, a new implementation body that has full jurisdictional support may also be warranted.

The National Strategy on Energy Efficiency has improved the coordination of energy efficiency measures across Australia, but problems remain. Ministerial council responsibility for energy efficiency is dispersed (and in some cases overlapping). There are also further opportunities to streamline policies and programs. While there are legitimate reasons for different actions to be embedded in different policy domains and at different levels of government, progress on energy efficiency requires concerted whole-of-government leadership.

To help overcome these challenges the Task Group recommends that the Australian Government (and the Council of Australian Governments):

- consider giving a single ministerial council, which is able to drive whole-of-government support, clear responsibility for energy efficiency
- consider establishing a new Australian Energy Commission to coordinate national action, or, as an alternative, establish an Energy Efficiency Commission.

Reform of governance arrangements for energy efficiency will define responsibility for leadership, coordination and delivery of a step-change improvement in energy efficiency over the next decade. For Australia to achieve this goal, those responsible for these functions must understand the objective and their roles in its realisation, and have the tools necessary to deliver it. We are a long way from this position.

This chapter reviews the challenges surrounding energy efficiency governance, considers current arrangements, and suggests possible ways forward to improve energy efficiency outcomes in both policy and implementation.

Reform of governance arrangements for energy efficiency will define delivery of a step-change improvement in energy efficiency over the next decade.

5.1 The governance challenge

Energy efficiency governance has been defined as:

> the use of political authority, institutions and resources by decision-makers and implementers to achieve improved energy efficiency.[1]

In the context of the Task Group's terms of reference, the governance challenge is to deliver a framework of coherence, focus and leadership in the next decade and beyond that creates appropriate accountabilities across a maze of competing priorities and ensures that policy settings are optimised.

Ineffective governance arrangements lead to:

- a lack of coherence or commonly defined goals to assist decision-makers in driving outcomes
- fragmentation and inefficiency in policy development and implementation — reflecting a multiplicity of duplicative or, worse, contradictory programs and policies
- additional compliance, reporting and administrative burdens
- inadequate data, information and analysis
- confusion about how to achieve energy efficiency in business and the community.

The Australian Alliance to Save Energy characterised the current situation as follows:

> Scaled-up energy efficiency implementation is currently dogged by a lack of co-ordination between levels of government, within different organisations in the same jurisdiction, and in harnessing the best ideas from across sectors.[2]

Figure 5.1 illustrates the complexity of current arrangements for energy efficiency governance in Australia. It appears to add weight to the view of the Australian Alliance to Save Energy. It shows that the Ministerial Council on Energy, which currently oversees many of the energy efficiency committee processes, is only one ministerial council among many dealing with energy efficiency issues and that its responsibilities now overlap to some extent with the process of implementing the COAG National Strategy on Energy Efficiency.

Notes to Figure 5.1

The figure includes key energy efficiency bodies but is not able to show all bodies involved in energy efficiency and their relationships to reflect the full complexity of governance arrangements.

Councils, committees and working groups have inter-jurisdictional representation.

All bodies responsible for National Strategy on Energy Efficiency measures report progress to the Senior Officials Group on Energy Efficiency.

Commonwealth, states, territories and local governments implement a range of energy efficiency programs outside of the COAG framework.

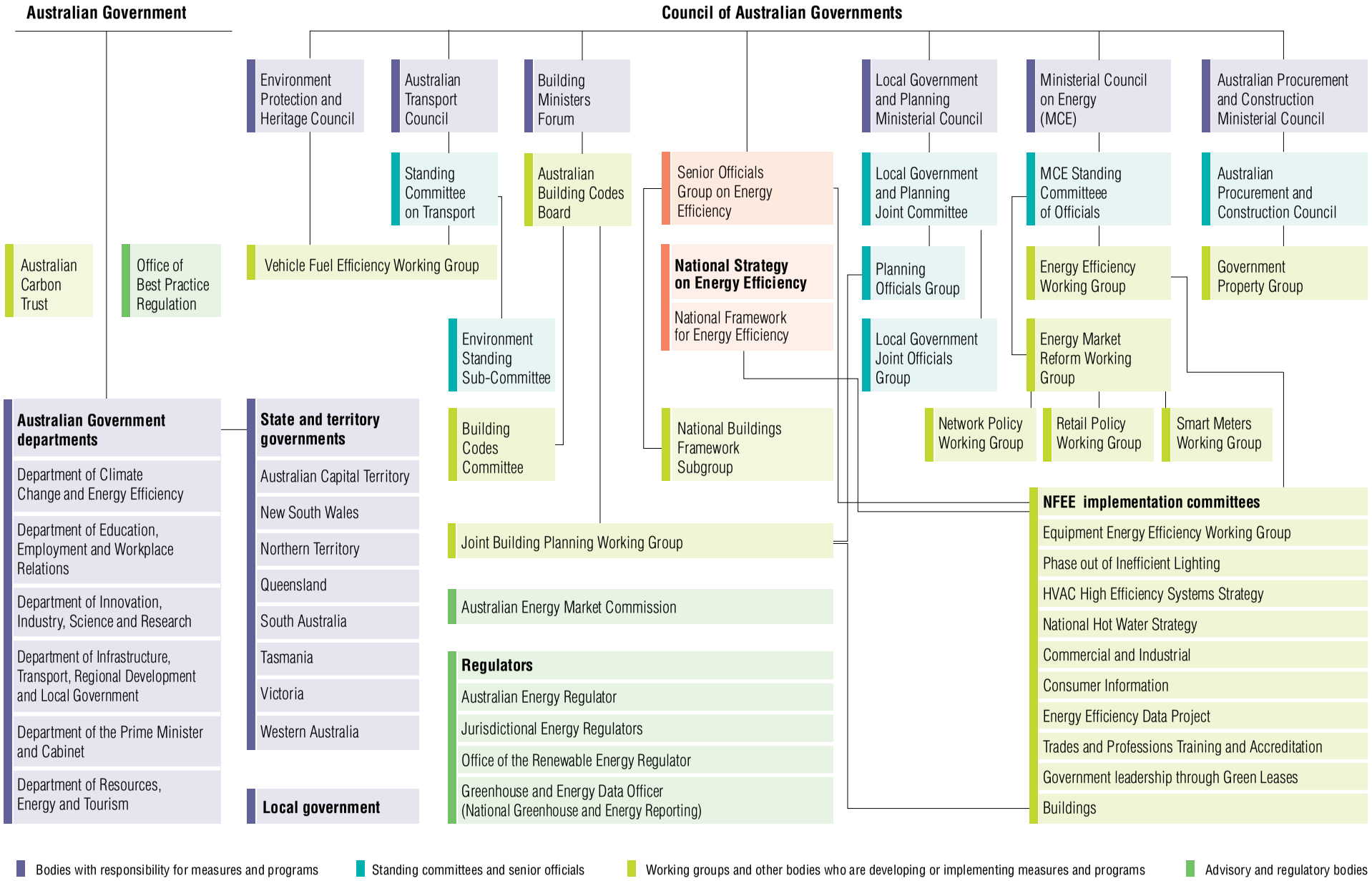


Figure 5.1 Current governance arrangements for energy efficiency

'it is very important for COAG to initiate a coordinated national approach to energy efficiency … there are too many programs.'

Wilkins Review

The Commonwealth, state and territory governments all have important roles to play in energy efficiency policy and program delivery. A strength of the Australian federal system is that it facilitates program and policy delivery tailored for the diversity of our communities, businesses, climates and infrastructure. Australian governments are generally effective at coordinating 'horizontally' (that is, internally or at one level of government). However, where we seek to coordinate and drive efforts to overcome complex problems in the pursuit of national objectives, explicit focus on 'vertical' governance is essential (that is, between different government levels). This, in the view of the Task Group, is a central challenge in enhancing energy efficiency.

Efforts to improve energy efficiency are likely to permeate all aspects of our economy and society over the foreseeable future. It is therefore appropriate that different actions be embedded within different policy areas and at different government levels. The complexity this causes is not necessarily a problem. Complexity is a problem, however, if it results in duplication and confusion which inhibits action — particularly if a coordinated and calibrated long-term effort is needed to achieve a national energy efficiency target. If responsibility lies everywhere it is not accepted anywhere. While many parts of all Australian governments must be engaged for real progress to be achieved, the coordination of these diverse inputs in a national effort requires concerted whole-of-government leadership.

The *Strategic review of Australian Government climate change programs* (the Wilkins Review) examined the governance arrangements for climate change programs, including energy efficiency. The review showed the overlap of programs between levels of government and differences in approaches between states and territories. It also identified at least 200 individual energy efficiency measures (in 2008; the estimate is now closer to 300 measures). The Wilkins Review concluded that 'it is very important for COAG to initiate a coordinated national approach to energy efficiency … there are too many programs'.[3]

The International Energy Agency has found that many countries' energy efficiency governance arrangements require attention, and that:

> unlike the supply side where many governments have robust, well-resourced long-term governance structures in place, demand-side/energy efficiency governance structures are less well established.[4]

Efficient and effective governance arrangements are clearly a requirement for a step change in energy efficiency outcomes, and Australia's current governance arrangements could be improved. In developing recommendations on governance arrangements, the Task Group used the following framework:

- principles — what elements or qualities are likely to produce real and sustainable outcomes?
- policy — which level of government or government council should lead policy decisions?
- delivery — how can we best deliver programs and achieve sustainable outcomes?

Principles

The Task Group drew heavily on observations by the International Energy Agency and the Wilkins Review, and previous Australian Government guidance on governance arrangements.[5] In doing so, the Task Group concluded that the following principles should guide governance reform and any rationalisation of policies and programs:

- Governance changes should aim to improve (across all levels of government):
  - accountability and clarity over responsibilities — including leadership roles
  - coordination and collaboration (to minimise duplication, among other things)
  - transparency
  - stability in policy and delivery
  - compliance, reporting and administrative processes
  - stakeholder participation and understanding—for business, not-for-profit organisations and the community
  - support from stakeholders to provide legitimacy (that is, stakeholder 'buy-in')
  - the data and information available to policy-makers and implementers
  - monitoring and evaluation of policies and programs.
- Action should be taken by the jurisdiction within which the benefits are likely to accrue (the benefits principle).[6]
- Where national action is justified, or where goods and services are delivered through national markets, they should be subject to nationally consistent regulation, usually most appropriately provided by the Commonwealth.[7]
- The capacity of jurisdictions to control the policy levers associated with an issue or problem should also be relevant in determining which level of government is best placed to intervene.[8]
- COAG's complementarity principles should help guide the development of governance arrangements and future policies.[9]
- Regular reviews of governance arrangements should be undertaken to test their effectiveness.

5.2 Existing measures

As shown in Figure 5.1, current governance arrangements for energy efficiency are dispersed across a number of ministerial councils and subordinate ministerial council bodies. The National Strategy on Energy Efficiency recognises the fragmentation of efforts across these bodies and has put in place an interim body, the Senior Officials Group on Energy Efficiency, to oversee, drive and report on the national energy efficiency effort across the spectrum of councils and bodies. But an officials group is constrained in undertaking this task, as it can neither make high-level policy decisions nor seek significant commitments across jurisdictions. This is appropriately the role of ministers.

The task is urgent, as the complexity of current arrangements, and the corresponding regulatory and reporting burdens, is probably the most widespread single complaint of industry regarding energy efficiency governance.

Given the limitations and problems with current arrangements, they are unlikely to deliver a decade of sustained coherence, focus and leadership or to ensure that policy settings are optimised so that a step change can be achieved.

> [T]he coexistence of different policy tools to promote end-use energy efficiency gains and the related public benefits, require a strong policy coordination effort at the institutional level.[10]

5.3 Recommendations for better governance

To deliver effective energy efficiency outcomes it is essential that accountability and leadership are clear.[11]

The Task Group considered three main options to deliver better governance:

- maintain the status quo — with multiple ministerial councils and agencies at all levels of government responsible for some elements of energy efficiency policy and delivery
- give the Australian Government a stronger lead role so that it 'covers the field', for example through enacting overarching energy efficiency legislation
- create a new joint Commonwealth, states and territories collaborative approach at both ministerial and implementation levels.

The Task Group concluded that, if the status quo were maintained, achieving a step change in energy efficiency over the next decade in a cost-effective and efficient manner would be unlikely and that the current fragmentation, duplication and confusion across all levels of government would continue to hinder reform.

A new ministerial council that reflects whole-of-government considerations and is able to drive whole-of-government support should be considered.

Clearer leadership responsibility

The Task Group also concluded that, while the Australian Government needed to take a stronger leadership role and while increased use of Australian Government powers may be constitutionally possible, this could undermine the important policy contribution and delivery roles that states and territories can provide.

To address the 'vertical' governance issue, the Task Group considers that the dispersion of roles in energy efficiency policy across ministerial councils and bodies needs to be resolved. If clear leadership responsibility for energy efficiency and an overarching policy development and coordination role are to be achieved, the Task Group believes a new ministerial council that reflects whole-of-government considerations and is able to drive whole-of-government support should be considered.

At its April 2010 meeting, COAG agreed, in the context of an independent review of ministerial councils by Dr Allan Hawke, to effect fundamental reform to the ministerial council system by March 2011. Accordingly, the Task Group recommends that the Australian Government consider seeking agreement to a single ministerial council with clear responsibility for energy efficiency as part of this broader review. This council would ideally be constituted by ministers with whole-of-economy responsibilities.

A complementary implementation body

Ministerial responsibility is only part of the picture. The Task Group suggests that the Australian Government consider establishing a complementary implementation body to coordinate national action. Such an organisation could be charged with key policy implementation, collaboration and administration functions for energy efficiency, as well as tracking national progress. To achieve a holistic and integrated approach to the way Australia governs energy, the Task Group considers that there is a strong case for building on the successful Australian Energy Market Commission (AEMC) model. The AEMC has responsibility for setting rules and providing policy advice on how best to develop energy markets over time and is jointly supported by jurisdictions and the Australian Government.[12] The development of the National Energy Market has been a successful reform process over the last decade.

The National Energy Market is an important part of Australia's energy landscape, and the Task Group believes considerable benefit could accrue if its settings were more clearly integrated with other aspects of Australia's energy effort (see chapter 12). Any change would, however, need to be approached cautiously to ensure that the proven functions and role of the existing AEMC, and the confidence that market participants have in it, are not undermined.

A new Australian Energy Commission?

In this context, the Task Group recommends consideration of the establishment of a new Australian Energy Commission. Such a new commission would need to carefully integrate the existing and proven functions of the AEMC with additional energy efficiency functions. This could be done by an expansion and restructuring of the AEMC or, perhaps, by the creation of a new body. If this occurred the governance framework for the next decade of reform would be established. This would, over time, move beyond achieving a balance between supply-side and demand-side actions in the gas and electricity markets to a holistic view of all energy use and needs — productivity, security, wellbeing and climate change.

Creation of a new joint body, if supported by all levels of government, could provide the catalyst and focus needed to drive energy efficiency action across diverse areas. The mandate for the proposed commission should be carefully defined; it would need sufficient independence, legitimacy and authority in order to be effective and enduring. This suggests that its role and powers would need to be embedded in legislation. It would also benefit from a stable funding source, such as a long-term funding strategy agreed by all jurisdictions, as is currently in place for the AEMC.

The high-level objective of a new commission in relation to energy efficiency could be to assist Australia in meeting its energy efficiency targets and/or other national energy efficiency goals. The possible roles and responsibilities of a commission, in addition to maintaining the important roles and responsibilities in place for the AEMC, could potentially include:

- tracking and reporting on progress in meeting national targets and/or goals
- advising governments in all jurisdictions on gaps, challenges and further initiatives required
- conducting comprehensive data collection and energy efficiency analysis (see chapter 6)
- overseeing behavioural change and engagement initiatives on energy efficiency (see chapter 7)
- providing administration or oversight of selected policies, regulatory regimes and programs.

While determining an appropriate scope for a commission would involve complex consideration by COAG, over time it could cover all forms of energy use. In transport, for example, at present many factors influencing energy use are specific to the sector. Over the next decade or more, this is likely to change, as convergence occurs towards the likely increased electrification and use of gas in land transport. As that happens, the case for ensuring coherence with broader energy sector developments would increase.

A commission could work under the guidance of the proposed ministerial council, and with relevant government departments at all levels. It would also benefit from strong links with other bodies, such the Energy and Data Officer under the *National Greenhouse and Energy Reporting Act 2007* and the Australian Building Codes Board, while working in conjunction with Australian energy market bodies. A commission could work with the Australian Carbon Trust in program delivery. Obviously, a reform of this scale would require careful implementation — full collaboration among jurisdictions would be essential, while areas of overlapping responsibility would require early resolution.

A stand-alone Energy Efficiency Commission?

As an alternative, the Task Group considered the establishment of a stand-alone Energy Efficiency Commission, modelled on the AEMC. This would still deliver a collaborative structure and provide a sound vehicle for implementation and delivery of energy efficiency. It would not, however, deliver the holistic approach needed in coming decades to address Australia's complex energy needs and embed energy efficiency as an important component of the approach. Accordingly, the Task Group concluded that the proposed Australian Energy Commission was the better option. The alternative — an Energy Efficiency Commission — may be appealing, however, if a simpler and more urgent solution were considered necessary to achieve progress in energy efficiency reform.

5.4 Expected outcomes

Policy and delivery outcomes for energy efficiency would be improved across the board if governance arrangements were reformed, with clear and overarching responsibility for energy efficiency being given to a single ministerial council and with the possible creation of a collaborative Australian Energy Commission.

Benefits would include:

- embedding the place of energy efficiency as a resource in Australian energy governance
- more effective on-the-ground delivery of energy efficiency programs, and less duplication
- stronger leadership and accountability
- increased focus on national priorities
- increased national productivity and a lower compliance burden
- a more robust, principled framework for future governance decisions
- increased information and analysis to support evidence-based policy and effective, targeted program delivery
- improved monitoring and reporting
- increased stakeholder understanding of, and engagement with, energy efficiency issues.

5.5 International precedents

Looking at governance arrangements in comparable countries provides some guidance as to possible models for change in Australia. Each country's arrangements are, however, to some degree unique to its wider governmental structures and political culture.

New Zealand, Canada and the United States all have dedicated energy efficiency and renewable energy delivery bodies. The types of bodies vary — in some cases they are separate statutory authorities, in others whole departments or offices within departments. However, these dedicated energy efficiency bodies do not typically operate across the layers of the Commonwealth, state and territory, and local governments in a collaborative manner, as contemplated above, or are not acting within a federated system.

Innovative energy efficiency and renewable energy delivery institutions such as government-owned corporations are also increasingly common, for example the UK Carbon Trust,[13] the UK Energy Saving Trust,[14] and the Energy Trust of Oregon.[15]

A 2008 World Bank report into frameworks for energy efficiency implementation identified several core competencies for an effective framework. These include:

- an ability to work collaboratively
- independence and flexibility in decision-making
- adequate resources, including staff and funding
- an ability to effectively engage with stakeholders
- a credible scheme for monitoring results.[16]

A separate international review, while reaffirming the competencies listed above, added that:

> Permanent institutions devoted to energy efficiency, such as agencies, allow for the development and implementation of a coherent energy efficiency strategy.[17]

Notes

1 N Jollands & M Ellis, *Energy efficiency governance: An emerging priority*, European Council for an Energy Efficient Economy 2009 Summer Study.

2 Australian Alliance to Save Energy, *Summary of energy efficiency advocates meetings*, 15–16 February 2010.

3 *Strategic review of Australian Government climate change programs*, 31 July 2008, www.finance.gov.au/Publications/strategic-reviews/index.html, p. 4.

4 International Energy Agency (IEA), *Energy efficiency governance: Reference Group terms of reference*, April 2009.

5 Department of Finance and Administration, *Governance arrangements for Australian Government bodies*, Commonwealth of Australia, 2005.

6 *Strategic review of Australian Government climate change programs*.

7 *Strategic review of Australian Government climate change programs*.

8 *Strategic review of Australian Government climate change programs*.

9 See Appendix A, Attachment B.

10 M Pavan, 'Tradable energy efficiency certificates: The Italian experience', *Energy Efficiency,* vol. 1, no. 4, 2008, p. 265.

11 IEA, *Energy efficiency governance*.

12 See www.aemc.gov.au.

13 See www.carbontrust.co.uk.

14 See www.energysavingtrust.org.uk.

15 See www.energytrust.org.

16 Cited in Jollands & Ellis, 2009. See www.esmap.org/filez/pubs/10292008124258_EE_Institutional.pdf.

17 Cited in Jollands & Ellis, 2009.

Innovation, data and analysis — establishing a continuum

This chapter outlines the importance of a coherent innovation strategy in facilitating a step change in energy efficiency and why improved data and analysis is a fundamental enabler for delivering energy efficiency.

Driving energy efficiency innovation, making use of leading-edge technologies, and transforming our business approaches will be essential if we are to accelerate our transition towards being among OECD leaders in the way we manage our energy.

The old adage that 'what's measured, gets managed' applies to energy efficiency. Without detailed information on what has worked, or not, in the past (and why), future investments and policies may be poorly targeted, wasteful and even counterproductive.

The Task Group recommends that the Australian Government consider developing:

- a national energy efficiency innovation pathway
- a comprehensive energy efficiency measurement and analysis platform.

These initiatives could provide Australia with the capability to confidently track progress towards a national target, inform business investment decisions, help answer emerging energy efficiency policy questions, and identify opportunities for national energy efficiency innovation.

Innovation — in technology development and application, and in business processes and models — will underpin Australia's prospects of achieving a step change in energy efficiency.

Informed and targeted innovation investment will help accelerate our transition towards being among OECD leaders in the way we manage our energy. Proposals that promote innovation are suggested throughout this report, from individual engagement (see chapter 7) through to demonstration initiatives for new technologies and business models (see chapters 9 and 11). This chapter investigates the potential value of an overarching strategy for innovation in energy efficiency.

The adage that 'what's measured, gets managed' applies to energy efficiency. Without detailed information on what has worked or not in the past (and why), future actions are likely to be poorly targeted and wasteful. Innovation may be hindered because levels of uncertainty and risk are too high for investors. Without the capacity to track, analyse and project our energy efficiency performance we will not be able to measure progress towards national goals. This could result in substandard decisions about where to best invest limited public and private resources.

The International Energy Agency has stated that:

> [L]ack of data — or not having the right data — may lead to misinformed policy decisions and sub-optimal choices that prove to be far more costly in the long term.[1]

A large proportion of Australia's low-cost abatement opportunities out to 2020 will involve unlocking opportunities in energy efficiency that are currently poorly understood. An effective framework of energy efficiency data and analysis to inform decisions and to target effort is essential.

> A fully integrated evidence base of Australian energy consumption and its potential to reduce it, could help to define new policy, refine existing policy, enable new energy efficiency business models and inform investment decisions into education, energy infrastructure and new technologies.
>
> CSIRO submission to the Task Group

While the focus in this report is on improving energy efficiency data in Australia, this process should be seen in the context of the need to enhance our understanding of energy supply and demand more broadly.

'Currently, the availability of broad and consistent energy efficiency data is limited, with little information about energy use in critical parts of the economy.'

NSEE

6.1 The innovation, data and analysis challenge

Most countries find measuring energy efficiency difficult for the reasons discussed in chapter 2. Australia is no exception. Unlike the best performers, however, Australia's energy efficiency data, analysis and modelling capability is limited and fragmented, making the measurement task even more challenging.[2]

The National Strategy on Energy Efficiency states that:

> Currently, the availability of broad and consistent energy efficiency data is limited, with little information about energy use in critical parts of the economy…[3]

This finding has been reaffirmed through the Task Group's consultations.[4]

It is not surprising, then, that there is no national strategy to focus and drive energy efficiency innovation in Australia.[5]

These shortcomings result in Australia lacking essential evidence to track progress, optimise policy settings, drive innovative energy efficiency solutions and facilitate private sector investment in energy efficiency. For example, without the capability to know what has worked in the past and why, or what actions are likely to be effective in Townsville, say, compared to Hobart, we run the risk of repeating previous mistakes and applying broadbrush solutions that are impractical, poorly targeted or unfit for purpose.[6]

> [G]ood data is needed if we are to provide advice in the right places, and know where the biggest and quickest energy savings can be made.[7]

Business costs and risks are also increased by these information and innovation gaps. When credible information is difficult and expensive to find, barriers to business development and investment are created. In the absence of guidance on national priorities for energy efficiency innovation, research institutions, businesses and governments do not know where best to invest their limited innovation capital or how best to target innovation gaps.

'Increasing our capacity to create new knowledge… is the key to building a modern economy based on advanced skills and technologies.'

Minister Carr

As the Minister for Innovation, Industry, Science and Research has noted:

> Increasing our capacity to create new knowledge and find new ways of doing business is the key to building a modern economy based on advanced skills and technologies.[8]

Data and analysis

Improving energy efficiency data and analysis is important for:

- identifying and understanding opportunities for improvements in energy efficiency at the level of detail needed to support investment decisions
- developing a better understanding of the barriers to energy efficiency take-up
- monitoring national energy efficiency performance over time
- assessing the impact of policies on energy efficiency
- benchmarking international energy efficiency performance
- meeting our international reporting obligations.[9]

The continuum within which data are gathered, analysed and turned into valuable knowledge can be captured by the following elements:

- data collection — including better collation of existing data, and improved data collection and integration at the national level
- analysis (turning data into information) — including maximising lessons from individual programs, producing projections, scenario modelling and policy investigations
- access (turning information into useful knowledge) — including making the information easy to access by the community and business, and developing tools and applications to help people use it effectively.

Compiling robust and credible data is important as it facilitates the next steps of analysis and access. Data being collected under current programs in Australia are potentially useful but difficult to identify and access. Their full value will only be realised if they can be brought together, analysed and made accessible. Collection of sectoral- and national-level data in an integrated way, which is targeted at the highest priority gaps, is also important. This reduces costs and helps provide an Australia-wide picture to inform future decisions at the national level.

Turning available data into useful information is the next challenge. Advanced energy efficiency analytic capabilities are lacking in Australia. Capacity to test

different policy options through scenario-style modelling or to assess whole-of-economy or sectoral energy choices in an integrated way is also very limited. The linking of supply-side understanding (such as information at the individual electricity generator level) with detailed demand-side projections (such as where network capacity constraints exist or how household consumption might change over time) will be important in overcoming this weakness.

Where information can be made more accessible and usable this can also help to promote innovation.[10]

> The accessibility of energy efficiency information and analysis by the energy industry is important for facilitating better decision making.[11]

Better availability of data would also assist in improving Australia's international reporting and in benchmarking our performance against that of other countries.[12] Chapter 2 discusses the challenge of measuring energy efficiency indicators at the national level.

> A limitation of Australia's current energy consumption data is that data are not available at a sufficient level of disaggregation to allow comparison with members of the IEA.[13]

'There is a lack of unbiased and quality information to assist businesses in their decision-making on energy efficiency …'

At present Australia does not have a body or process with the mandate to collect and link energy efficiency data, to analyse it, or to help people gain access to it. Ultimately this deficiency exposes both business and the different levels of government to the risk of 'being in the dark' in seeking to optimise energy efficiency.[14] It also reduces business and community opportunities because there is no central source of trusted and easy-to-access information and few tools to assist decision-making. The Task Group was told repeatedly in its consultation process that establishing an access hub should be a priority.

> There is a lack of unbiased and quality information to assist businesses in their decision-making on energy efficiency projects and the options that they have available to them for completing projects.
>
> Siemens submission to the Task Group

Innovation

Innovation is about 'improving the things we make and the way we make them — the services we deliver and the way we deliver them'.[15] Innovation goes beyond pure research, development, demonstration and deployment to include:

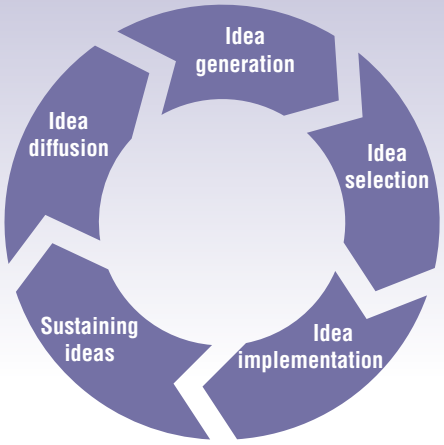
- empowering people to innovate
- changing our processes and methods
- developing new business practices and new collaborations.

Delivering innovation also includes international collaboration and working with a range of stakeholders across the economy and community. The OECD has defined innovation as:

> the implementation of a new or significantly improved product (good or service), process, new marketing method or a new organisational method in business practices, workplace organisation or external relations.[16]

The innovation process should be a continuous cycle where we learn from our own innovative activities and those of others and apply that learning and the new ideas it generates to future activities. A simple conceptual model of innovation can be found in the recently published Australian Government document *Empowering change*.[17] The different stages of innovation are illustrated in Figure 6.1.

Figure 6.1 The innovation process



Ultimately the lack of energy efficiency innovation could delay a step change, or make it more expensive.

Source: Adapted from WD Eggers & SK Singh, *The public innovator's playbook: Nurturing bold ideas in government*, Deloitte Research, 2009, p. 7.

Each stage of innovation is most effective when it is informed by credible data and analysis so that it is well targeted.[18]

The Australian Government has stated that it:

> wants a national innovation system in which the Commonwealth clearly articulates national priorities and aspirations to make the best use of resources, drive change, and provide benchmarks against which to measure success.[19]

However, despite energy efficiency being a national priority,[20] there is no coherent innovation strategy for energy efficiency to help make the national innovation agenda 'concrete' for energy efficiency businesses.

Without a coherent and tailored innovation strategy for energy efficiency, opportunities may remain unexploited and efforts fragmented. Without targeted programs that test, experiment with, and demonstrate new technologies and business models, these could take longer to become standard practice. Without a focused effort to tap into international advances in technology, Australia may continue to lag behind other OECD countries.

Ultimately the lack of energy efficiency innovation could delay a step change, or make it more expensive. In short, we are likely to be less effective at improving the energy efficiency of the things we make and the services we deliver.

6.2 Existing measures

Data and analysis

Figure 6.2 illustrates the many different and fragmented sources of current data, or the data and analysis 'integration challenge'. While cooperation between agencies can always be improved, gaining better access to existing data is only one part of the problem. The breadth of the data and analysis integration challenge exists because of a lack of capacity to:

- make the best use of existing data
- target new data collection
- provide analysis that can adequately inform decision-making
- facilitate appropriate access by all stakeholders.

Figure 6.2 The data and analysis integration challenge

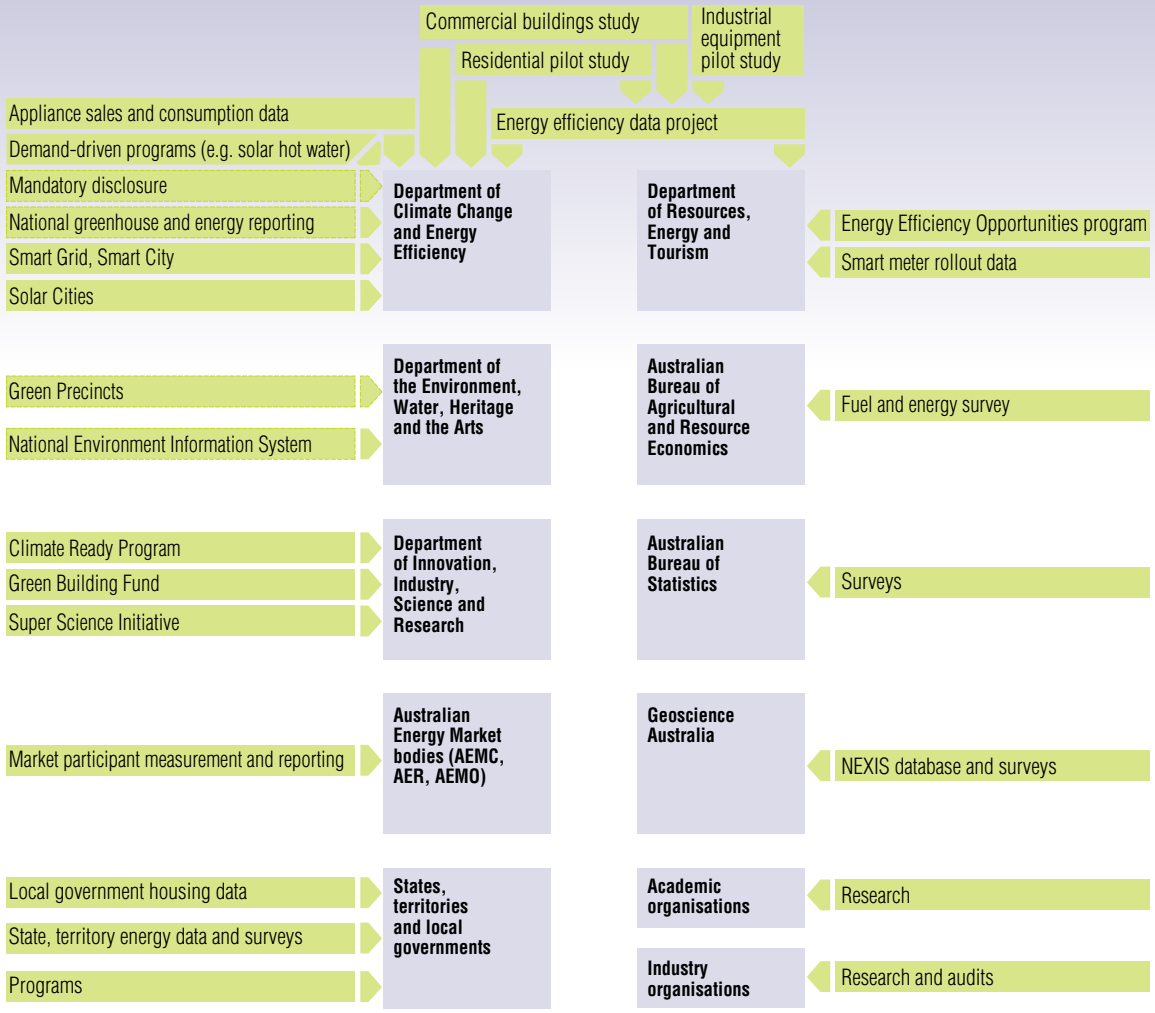


Figure 6.2 identifies valuable existing or emerging stores of data from current programs such as Solar Cities; Smart Grid, Smart City; and the Energy Efficiency Opportunities program; and from information arising out of individual household or business energy efficiency and renewable energy programs.

Dedicated existing or emerging data collection measures shown include the Energy Efficiency Data Project; the *National Greenhouse and Energy Reporting Act 2007* (NGER Act); and the National Environmental Information System. These are supplemented by surveys and reports by the Australian Bureau of Statistics and the Australian Bureau of Agricultural and Resource Economics.

Despite these programs, gaps still exist in the current dataset (see Box 6.1). For example, although the NGER Act introduced a national framework for reporting and dissemination of information about greenhouse gas emissions and energy use and production,[21] there are no data collected on areas such as households and small to medium enterprises.[22] The Energy Efficiency Data Project is another important measure, which may help to address some of the remaining data gaps. However, its main focus is on the preliminary definition and scoping of potential future data collections, which will rely on future allocations of resources before they can be delivered. The project does not focus on providing information to business or the community.

> It is increasingly apparent that there is a strong need for better data to enable a more evidence-based approach to developing new energy efficiency policy…[23]

Current measures focus heavily on one-off historic data 'snapshots' rather than helping to plan for the future through the collection of time series and cross-sectional data suitable for:

- extracting lessons learnt
- developing projections
- analysing scenarios
- helping underpin decision support tools.

The most serious defect depicted in Figure 6.2 is the absence of a central coordination point focused on providing easy one-stop-shop access so that all stakeholders — including all levels of government, business and the community — can integrate information based on existing and new data.

Box 6.1 Data gaps in energy efficiency — some examples

Poor energy consumption information

Substantial gaps exist in energy consumption information for the household and buildings sectors, but also for small to medium businesses and in the transport sector. What data are available often lack detail or are collected infrequently.

International best practice examples include Canada and the United States, which conduct detailed and regular energy use surveys to characterise building types, appliance usage, demographic information and fuel consumption.

If this energy consumption information gap were filled — that is, if we had a better understanding of where and how energy is used across our society — Australia could design more effective and targeted policies and better track progress towards a national energy efficiency target.

Poor energy price data

There is no central, regular, comprehensive or detailed source of energy price information in Australia. For example, detailed electricity retail price data are not collected and published regularly, which hampers accurate and up-to-date policy impact analysis and business decision-making.

International best practice examples include New Zealand (energy price data collected on a quarterly basis) and the United States (detailed energy price data collected and published by location, consumer type and demographic circumstance).

If this energy price information gap were eliminated, Australia could better examine national and international competitiveness issues, better understand national supply and demand dynamics, and better meet our international reporting obligations.

Other data gaps

- *Innovation and technology cost information:* Information about energy efficiency technology potential, current or projected technology costs, and levels of innovation investment is either not specific or not current.
- *Tracking progress over time and understanding change:* Australia has neither an ongoing nor annual data collection system for energy efficiency.
- *People and behaviour:* Data about people's attitudes and behaviours regarding energy efficiency are limited, with no systematic collection process in place.
- *Data access:* There is no single source of energy or energy efficiency data or analysis in Australia to allow easy and quick access for policy analysis, business development or community use.

A further summary of international energy efficiency and energy data efforts is provided in section 6.5.

Note: The data gaps identified above are derived from unpublished reviews of Australia's energy statistics and from analysis undertaken for the Energy Efficiency Data Project.

Innovation

Existing programs related to clean energy and energy efficiency (to varying extents) include:

- the Green Car Innovation Fund
- Clean Business Australia (which incorporates Climate Ready, the Green Building Fund, and Retooling for Climate Change)
- the Clean Energy Innovation Centre.

Various industry innovation councils, Australian Research Council grants, cooperative research centres, and elements of the CSIRO work program also contribute to the innovation effort. The Australian Government's R&D tax concession provides a further incentive for Australian industry to undertake research and development.[24]

Some programs with an energy efficiency component have now fully committed their funds or are close to finalisation. Furthermore, as discussed above, there is no national strategy in relation to energy efficiency innovation to guide how the various programs should fit together, how Australia's energy efficiency innovation efforts should be targeted, or how best to speed up adoption of international advances.

6.3 Recommendations for a step change in innovation, data and analysis

Given the gaps highlighted above, the Task Group recommends that the Australian Government consider developing:

- a comprehensive energy efficiency measurement and analysis platform
- a national energy efficiency innovation pathway.

By improving the overall energy efficiency innovation, data and analysis situation in Australia, these initiatives could provide Australia with the capacity to:

- track progress toward a national target
- help answer emerging energy efficiency policy questions
- inform possible change to meet the target
- identify national innovation opportunities to help focus research and demonstration efforts.

Data and analysis

An energy efficiency measurement and analysis platform (or EE-MAP) would require a new national collaboration aimed at developing advanced analytical tools and modelling capacity, and delivering coordinated data collection, analysis and dissemination.

Establishment of an EE-MAP could bring together the array of energy efficiency institutions and players to synthesise available data, help remove remaining information gaps, create assessment and modelling tools, and provide a central data and information hub. By providing such a hub, it could facilitate an integrated national approach to energy efficiency data collection, analysis and information dissemination, and importantly a single central hub and focal point for national energy efficiency data.

Figure 6.3 illustrates how an EE-MAP could work.

Figure 6.3 The energy efficiency measurement and analysis platform

ABARE Australian Bureau of Agricultural and Resource Economics

ABS Australian Bureau of Statistics

AEMO Australian Energy Market Operator

DCCEE Department of Climate Change and Energy Efficiency

DEWHA Department of the Environment, Water, Heritage and the Arts

DIISR Department of Innovation, Industry, Science and Research

DRET Department of Resources, Energy and Tourism

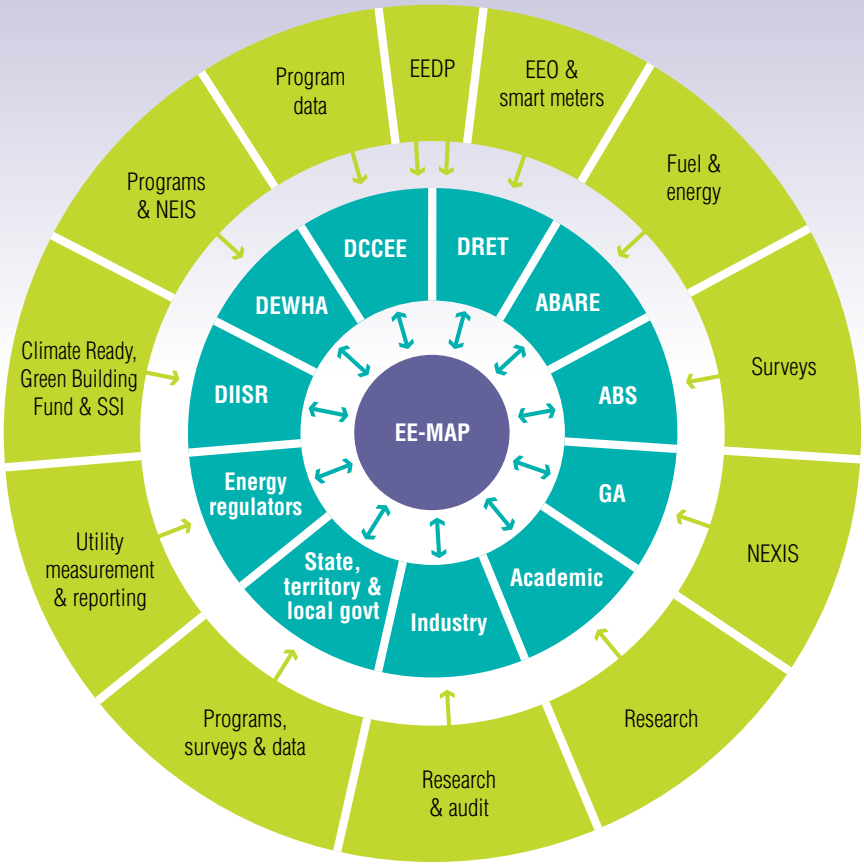
EEDP Energy Efficiency Data Project

EEO Energy Efficiency Opportunities program

GA Geoscience Australia

NEIS National Environment Information System

SSI Super Science Initiative



In addition to mining the wealth of data from current energy efficiency programs, an EE-MAP could link and enhance current data initiatives, such as National Greenhouse and Energy Reporting and the Energy Efficiency Data Project. It could also identify new low-cost avenues for data collection — for example, seeking to ensure that information from the smart grid deployment, building assessments under mandatory disclosure and new building ratings is captured and integrated.

The analysis centrepiece for an EE-MAP could be the development of a comprehensive national energy efficiency model. This could include granular modelling and scenario projections capacity for key sectors (such as linking electricity supply and demand, and modelling the national building stock). A national energy efficiency model and its sector-specific modules would be powerful tools to:

- identify future step-change opportunities (nationally, geographically, or by jurisdiction or sector)
- identify specific elements that could make them happen
- quantify their likely impacts.

An EE-MAP could also provide a one-stop shop for access to energy efficiency data and key national reports (such as energy projections). Access could be tailored to meet the needs of government, industry and the community. Methods of access could include making information and applications accessible on the internet (for example, through an energy efficiency data portal), the publication of reports or journal articles, and possibly providing 'data mining' or analysis services upon request (for example, to produce scenario models for government policy decisions).

Box 6.2 Potential energy efficiency measurement and analysis platform applications

Example 1

An energy service company is considering investing in local combined heat and power solutions for apartment buildings and industrial sites within a metropolitan area. The company could use the information and applications within the EE-MAP to identify locations where such installations are likely to be feasible in terms of land-use mix and possible network benefits.

Example 2

At a one-stop energy information centre, anyone seeking energy consumption data goes to the EE-MAP web portal as the central source of credible energy information — such as downloading a data snapshot or searching for energy projections for different sectors or geographic areas.

Example 3

A government agency considering future options for improving energy efficiency uses information from the EE-MAP (such as where previous programs have had high or low take-up of particular technologies) to develop a well-targeted program to fill remaining gaps or to have an impact on specific areas — for example, running scenario models to evaluate different types of incentives for households. Providing harmonised data also helps to coordinate efforts across the three levels of government.

Example 4

A local council or community action group in a regional town is considering options for reducing emissions and improving energy reliability within its local community. It uses the EE-MAP and its applications to assess the potential of different distributed energy options and help broker partnerships between local businesses and households to invest in local energy initiatives.

Innovation

The development of an energy efficiency innovation pathway could provide an overarching strategy to identify energy efficiency innovation needs and priorities to help invest in, and harness, future step-change technologies and approaches for Australia.

An energy efficiency innovation pathway could take the form of both a process and a publication — in that it would ideally be based on significant stakeholder consultation, with the view to publishing a national innovation strategy for energy efficiency.

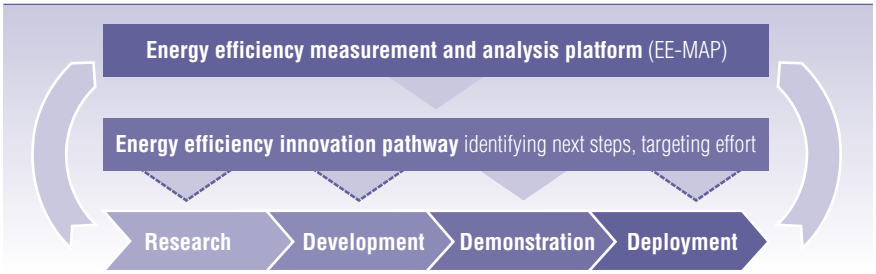
A comprehensive pathway would serve as a focusing mechanism to ensure Australia is an informed and fast adopter of international solutions and also to focus Australian collaboration in the international energy efficiency technology arena. It could also examine how to spur innovation in more energy-efficient processes and methods, encourage new business models, and build new innovative partnerships.

The development of any innovation pathway should occur in close consultation with industry, researchers and the community. Undertaking detailed subsector-specific analysis as part of an overarching strategy could help to make it practical and useful to business. An important question that could be considered is what national research and testing infrastructure might be needed to ensure national standards are met and to help build industry confidence in emerging technologies.

A well-developed energy efficiency innovation pathway could inform future measures and action across the innovation spectrum. It would also work together with the other innovation-related proposals throughout this report, such as the precinct-scale demonstration initiatives discussed in chapter 11.

A pathway would also be supported by development of the EE-MAP discussed above, as this would provide detailed data and information about Australia's energy efficiency performance. Together these two proposals could create a data, analysis and innovation continuum.

Figure 6.4 The data, analysis and innovation continuum



6.4 Expected outcomes

The actions recommended above could be expected to produce the following outcomes if they are well designed and effectively implemented:

- robust monitoring and reporting on progress toward a national target
- sophisticated targeting and coordination of energy efficiency policies and programs across all three levels of government through improved data and analysis
- maximisation of the value of current data
- increased capacity and expertise in analysis of energy efficiency data
- improved public engagement through provision of more information to multiple stakeholders and, especially, procurement decision-makers
- support for the data collection streamlining agenda, minimising industry information discovery burden
- productivity gains though improved coherence and informed focusing of national innovation efforts
- provision of vital information to businesses to ensure efficient investment of private sector capital in capturing energy efficiency opportunities
- better pay-offs from limited resources
- international technology collaboration benefits (such as enhanced participation in the Major Economies Forum on Energy and Climate's Global Partnership for low-carbon and climate-friendly technologies)
- better reporting to international bodies, such as the International Energy Agency, and international benchmarking.

6.5 International precedents

Several international examples of similar reforms to overcome information and innovation barriers are worth noting.

Specific energy efficiency or energy data initiatives are in place or in development in Canada, Indonesia, Japan, New Zealand, the United Kingdom and the United States. In addition to the International Energy Agency, a group of 29 European countries, led by France, collaborate to track data on energy efficiency. Examples of international best practice follow.

- The United States has a long-established Energy Information Administration (with approximately 400 staff and an annual budget of more than US$100 million) — providing a centrally available information repository, a national energy modelling system, scenario analysis capabilities and Annual Energy Outlooks projecting trends out to 2035.[25]

- The New Zealand Ministry of Economic Development has lead responsibility for energy information, analysis and modelling, guided by a strategic data Energy Domain Plan. The ministry publishes an annual Energy Outlook and quarterly energy statistics (including retail price information), and provides detailed energy data via the internet.[26]
- The United Kingdom is developing pilots of a new national energy efficiency data framework that will link information covering all buildings in the United Kingdom from existing databases in a consistent manner, combining data from energy suppliers, buildings, installers and other sources. The United Kingdom is also working on continuous household surveys to build on existing data.[27]

Box 6.3 International best practice in energy data and analysis — a focus on Canada

Canada is renowned for the excellence of its energy efficiency data and analysis. In 1991 Natural Resources Canada launched the National Energy Use Database initiative to improve knowledge about energy consumption and energy efficiency at the end-use level. Its most important role is to secure the development of a reliable, Canada-wide information base on energy consumption for all energy-consuming sectors.

Under this initiative, Natural Resources Canada established a network of data and analysis centres, each located at a university, to form centres of excellence. Three such centres already exist:

- the Centre for Data and Analysis in Transportation
- the Canadian Industrial Energy End-Use Data and Analysis Centre
- the Canadian Building Energy End-Use Data and Analysis Centre.

The centres have a mandate to improve access to energy efficiency data and analysis—together they produce a comprehensive annual report titled *Energy efficiency trends in Canada* (most recently covering the period from 1990 to 2007); a survey of household energy use; a comprehensive energy-use database; energy-use data handbook tables; and analysis tables on energy efficiency trends, as well as other products.

An innovative feature of the Canadian approach is that each centre has a board that includes industry and end-user representation. The board provides guidance on priorities for data gathering, analysis, research and publications at a sectoral level, and also assists in raising private funding for specific analysis projects.

For example, the Building Energy End-Use Data and Analysis Centre covers issues such as:

- energy consumed in buildings and the factors influencing energy efficiency
- energy-related practices and behaviours of households, building managers, owners, builders and occupants
- building and environmental awareness
- purchase and use of appliances and energy equipment
- physical characteristics of buildings and their effects on energy use
- billing of energy consumption and various topics related to utility companies
- energy-related renovations and investments
- effectiveness, measured or estimated, of government programs and other policies for reducing energy use in buildings
- energy price evolution, awareness and the responsiveness of demand to energy price changes
- organisation of energy markets.

Initiatives to promote energy efficiency and clean energy innovation are found internationally, either at the broad national level or within particular sectors:

- The United Kingdom undertook an energy efficiency innovation review in 2005, which investigated 'how to accelerate the development of new, energy-efficient technologies'.[28]
- In 2009 the United States announced US$377 million in funding to establish 46 Energy Frontier Research Centres pursuing breakthroughs in clean energy technologies.[29]
- The United States has also published sectoral 'research and development agendas' to focus national innovation efforts — such as the Net-Zero Energy, High-Performance Green Buildings Agenda.[30, 31]

To promote multilateral clean energy innovation, in July 2009 the leaders of the Major Economies Forum (MEF) on Energy and Climate launched the Global Partnership for low-carbon and climate-friendly technologies. Work under this partnership has estimated a global annual clean energy innovation investment gap approaching US$20 billion. As an initial step, technology action plans have been developed across a range of sectors, including advanced vehicles; buildings sector energy efficiency; industrial sector energy efficiency; smart grids; and several supply-side categories. These action plans aim to help MEF member countries 'scale up clean energy innovation investment consistent with their stated intention to at least double clean energy innovation funding by 2015'. The MEF Technology Action Plan states that:

> Countries can further enhance innovation through information sharing, including joint development of technology innovation roadmaps and alliances and networks of research institutes.[32]

As the examples above show, international leaders in energy efficiency are making concerted efforts to collect and manage energy efficiency data. As a member of the Major Economies Forum, Australia could do more to tap into and participate in these multilateral innovation initiatives. Doing so could help lower our overall costs of transitioning to a low-carbon future.

6.6 Implementation

As indicated earlier, establishing an energy efficiency measurement and analysis platform would involve investment in the development of advanced analytic tools and modelling capacity as well as the delivery of coordinated action on data collection, analysis and communication. This would need to be supported by clear leadership and collaboration arrangements between government agencies at the Commonwealth level. A COAG-level agreement, to draw in appropriate state and territory agencies and institutions, would further enhance the approach.

Relevant Australian Government organisations include government departments (in particular, the Department of Climate Change and Energy Efficiency and the Department of Resources, Energy and Tourism); and other bodies (such as the Australian Bureau of Statistics, the Australian Bureau of Agricultural and Resource Economics, Geoscience Australia, the Australian Energy Market Commission, the Australian Energy Regulator, the Australian Energy Market Operator, and the Commonwealth Scientific and Industrial Research Organisation).

The proposed energy efficiency innovation platform would also benefit from a collaborative development approach, involving close consultation with industry leaders and the academic community.

It is estimated that an EE-MAP could take three to four years to be fully established, but some data and sectoral improvements could be made within the first year. A comprehensive and sector-relevant innovation platform could be completed within two years.

'Improving data, analysis and innovation should lead to considerable economic benefits over time.'

The EE-MAP and innovation pathway would continue to be important in the context of a domestic emissions trading scheme to assist in tracking towards national targets, more effectively focus complementary policies and help prepare for even more ambitious emissions reduction targets beyond 2020.

The longer-term management of the EE-MAP could be allocated to an energy commission of the type canvassed in chapter 5.

6.7 Expected benefits and costs

Expected change in energy and emissions

No direct estimate of energy savings or emissions reductions has been made as improved data, analysis and innovation would enable reductions through other programs, or by households or businesses, that were unrelated to additional policy action.

Economic costs

Broader economic costs are considered negligible; indeed improving data, analysis and innovation should lead to considerable economic benefits over time. An EE-MAP would support more economically efficient decisions (by policy-makers, businesses and individuals) and could also lower business information search costs by providing reliable detailed information in one central location. The development of an energy efficiency innovation pathway would be likely to increase efficiency and productivity, particularly towards 2020.

Notes

1 International Energy Agency, *Energy use in the new millennium: Trends in IEA countries—energy indicators*, 2007.

2 Energy Efficiency Data Project, Department of Resources, Energy and Tourism, extracts from final report, 30 June 2009; also submissions to the Task Group by CSIRO, the National Institute of Economic and Industry Research, and pitt&sherry.

3 COAG, National Strategy on Energy Efficiency, July 2009, at www.coag.gov.au, p. 13.

4 In addition to the submissions in note 2, see submissions by Consult Australia; Engineers Australia; and NSW Government.

5 Although the National Strategy on Energy Efficiency instituted a range of new measures, some of which would spur innovation in energy efficiency, it did not constitute a comprehensive, innovation-focused approach.

6 This point is recognised internationally, including by Canada's Office of Energy Efficiency (see www.oee.nrcan-rncan.gc.ca) and Statistics New Zealand (see the Domain Plan for Energy Sector at www.med.govt.nz/upload/38617/domain-plan-for-energy-sector-20061017.pdf).

7 UK Department of Energy and Climate Change at www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/esdirective/data_framework/data_framework.aspx, accessed 23 June 2010.

8 K Carr, *Powering ideas: An innovation agenda for the 21st century*, Foreword, Commonwealth of Australia, 2009.

9 Energy Efficiency Data Project.

10 See *Engage: Getting on with Government 2.0*, www.finance.gov.au/publications/gov20taskforcereport/summary.htm.

11 Domain Plan for Energy Sector, www.med.govt.nz/upload/38617/domain-plan-for-energy-sector-20061017.pdf, accessed 23 June 2010.

12 Australia regularly reports energy and energy efficiency information to bodies such as the International Energy Agency.

13 Energy Efficiency Data Project.

14 S Maher, 'Council in the dark on Rudd's reforms as relevant data does not exist', *The Australian*, www.theaustralian.com.au/politics/council-in-the-dark-on-rudds-reforms-as-relevent-data-does-not-exist/story-e6frgczf-1225875236472, accessed 4 June 2010.

15 *Powering ideas*.

16 OECD, Oslo Manual guidelines for collecting and interpreting innovation data, 3rd edn, OECD & European Commission, Paris, 2005.

17 Management Advisory Committee, *Empowering change: Fostering innovation in the Australian Public Service*, Australian Government, Canberra, 2010.

18 OECD, The OECD innovation strategy, 2010.

19 *Powering ideas*.

20 Former Prime Minister Rudd described energy efficiency as the 'second plank' in drawing down carbon emissions when speaking at the Fourth Australia & New Zealand Climate Change and Business Conference.

21 See www.climatechange.gov.au/reporting.

22 Energy Efficiency Data Project.

23 Energy Efficiency Data Project.

24 See www.innovation.gov.au/Section/AboutDIISR/FactSheets/Pages/RDTaxConcessionBERDFactSheet.aspx.

25 See www.eia.doe.gov.

26 See www.med.govt.nz/templates/StandardSummary_37.aspx.

27 See www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/esdirective/data_framework/data_framework.aspx.

28 United Kingdom Treasury, *Energy efficiency innovation review: Summary report*, 2005, http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/media/3/C/pbr05_energy_675.pdf, accessed 30 June 2010.

29 See www.energy.gov/news2009/7768.htm, accessed 15 July 2010.

30 See www.bfrl.nist.gov/buildingtechnology/documents/FederalRDAgendaforNetZeroEnergyHighPerformanceGreenBuildings.pdf, accessed 15 June 2010.

31 It is also worth noting that one of the US Office of Energy Efficiency and Renewable Energy's two key functions is to work to bring 'clean, reliable and affordable energy technologies to the marketplace'. See www.eere.energy.gov/ba/pdfs/pmguide_chapter_1.pdf.

32 See *Technology Action Plan: Executive summary*, at www.cleanenergyministerial.org/the_global_partnership.html.

Building an energy efficiency culture—living and working smarter

To achieve a step change in energy efficiency, Australians will need to routinely recognise the value of energy efficiency when making decisions in their homes and their businesses.

Evidence suggests that a shift in the way we think about energy efficiency of the order achieved in water demand management and recycling is possible. This could achieve savings in energy use (2–15 per cent has been documented in Australian and overseas examples) and increase energy users' readiness to respond effectively to future price signals.

A new national and holistic approach to supporting energy-efficient decision-making could better equip Australians to understand and manage their energy use and bills. This could be achieved by developing a national, coherent and consistent strategy that:

- motivates energy efficiency and creates a compelling call to action by addressing current gaps in consumer understanding (making energy use more visible, material, tangible and personally relevant)
- makes action on energy efficiency easier by making choices easier to access, understand and compare
- engages individuals, communities and businesses in an ongoing society-wide effort through both local grassroots partnerships and national communications.

This report identifies a range of options for increasing the take-up of cost-effective energy efficiency in the Australian economy. To enable these recommendations to have maximum effect, and to increase the capacity of energy users to respond to a carbon price, Australians would need to move towards adopting systematic energy-efficient behaviours as the norm rather than the exception, in the same way that water savings actions have become the norm in many households, communities and businesses in recent years. This chapter discusses the potential role of the Australian Government in encouraging such a change.

Research shows that most Australian energy consumers (households and businesses) support energy efficiency in principle and are taking some action to reduce their energy use (for example, by replacing light bulbs or washing clothes in cold water).[1] But these ad hoc actions are being offset by increased demand for energy from other uses (for example, wider use of computers and entertainment equipment) and consumers show very little awareness that their total energy use is rising.[2]

It is difficult to see how a more systematic approach to energy efficiency can become routine without a strategic effort to engage individuals, communities and businesses. The goal of such an approach would be to equip energy users to better understand and manage their total energy use and bills. This could achieve savings in energy use (2–15 per cent has been documented in Australian and overseas studies (Box 7.3)), and increase energy users' capacity to respond effectively to rising prices, now and into the future.

7.1 The behavioural challenge

Australia's energy costs have traditionally been very low by international standards. Energy bills account for 2–4 per cent of expenditure in an average household (with an additional 3–4 per cent on vehicle fuel).[3] Some 95 per cent of Australia's output comes from firms that spend less than 3 per cent of their costs on energy.[4]

Despite this small share of total expenditure, the heightened community sensitivity to the modest price rises that had been anticipated under the Carbon Pollution Reduction Scheme (estimated over the first two years of the CPRS as around 19 per cent for electricity, 11 per cent for gas and less than 1 per cent for all other products[5]), notwithstanding extensive compensation, indicates a critical need to assist Australian households and businesses to better manage their future energy bills.

Paradoxically, many energy consumers, whether household or business, appear to have low engagement in and understanding of energy use, how different energy-using activities drive costs and how to manage their energy bills. As a result, the transaction costs associated with improving energy efficiency can often be perceived as higher than the benefits.

Household energy use

Domestic energy use per household has continued to climb in recent decades, with emissions from household electricity use growing almost 20 per cent in the last 15 years.[6] This is despite improvements since the mid 1980s in regulatory energy efficiency standards for appliances and buildings.[7] Increasing real incomes have meant that individuals at home and at work can readily increase the scale of their energy demand.

Research shows that household consumers are largely unaware that their energy use is increasing.[8] The invisible, intangible and immaterial nature of energy in most households and businesses leads to very low engagement in personal energy use.

> Most people believe that they are doing about as much as is reasonably possible or currently affordable to live more sustainably. Whilst they are already taking some action, a vast majority are generally not actively looking to do more.[9]

There is slow turnover in the stock of homes, appliances (most large appliances, such as refrigerators or hot-water systems, are in the home for more than 10 years) and vehicles (most cars are on the road for nearly 20 years). This means that decisions taken today will have long-term consequences for both individual and aggregate energy costs.

Improvements in consumer awareness and heightened responsiveness to energy use in the short term are likely to reduce the overall costs of responding to climate change in the longer term.

Improvements in consumer awareness and heightened responsiveness to energy use in the short term are likely to reduce the overall costs of responding to climate change in the longer term. An investment in consumer engagement is therefore complementary to longer-term climate change objectives, and will also help Australians gain greater control and choice over their expenditure.

While householders represent only a modest proportion of energy use in the economy — 18 per cent in terms of emissions[10] — their priorities drive behaviour in business, industry and government through their roles as customers, employees, employers and decision-makers. Achieving and maintaining major economy-wide change will be more difficult unless two issues are addressed: the current lack of information and the low levels of knowledge among consumers of their individual energy use.

Business energy use

Most businesses support the idea of saving energy to restrain costs and increase productivity. However, the Energy Efficiency Opportunities program, where large businesses are required to seek and report on specific opportunities to save energy (discussed further in chapter 8), demonstrates that businesses may not actively seek energy-saving options without external drivers. The same issues of 'invisibility, intangibility and immateriality' exist in businesses as in households.

Barriers to the take-up of cost-effective energy efficiency opportunities by businesses include the following:

- Business priorities often focus on building and growing the business.
- Management time for trimming relatively small input costs is generally rationed.
- Organisational structures create barriers, with division of roles within the business leading to split responsibilities (for example, the area that purchases energy and manages energy costs may be a long way from the operational areas that use the energy, even in a small business).
- There is often no metering on different activities in a business and so it can be unclear whether or where energy waste is occurring.[11]

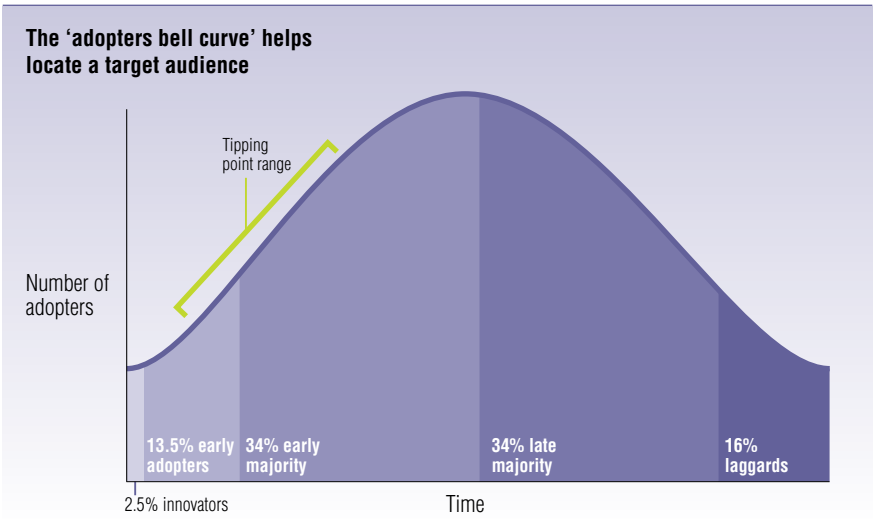
A shift in societal norms

A long-term sustained change in overall consumer behaviour requires a fundamental shift in societal norms.

Behavioural research shows that in uncertain situations, the tendency to use the most accessible information will often result in people imitating the behaviour of others. Indeed, it is well established that the more we see others behaving in a certain way or making particular decisions, the more we are likely to follow suit.[12]

Once a critical mass of people — between perhaps 10 and 20 per cent—have adopted a new behaviour or a new technology, then that behaviour becomes the norm, and most of the rest of the population will adopt it as a matter of course (see Box 7.1). This pattern is reflected in the diffusion curve illustrated in Figure 7.1.[13]

Figure 7.1 Adoption patterns of new technologies and behaviours



Source: Adapted from E Rogers, *Diffusion of innovations*, 2003.

Box 7.1 The importance of leadership in societal norms

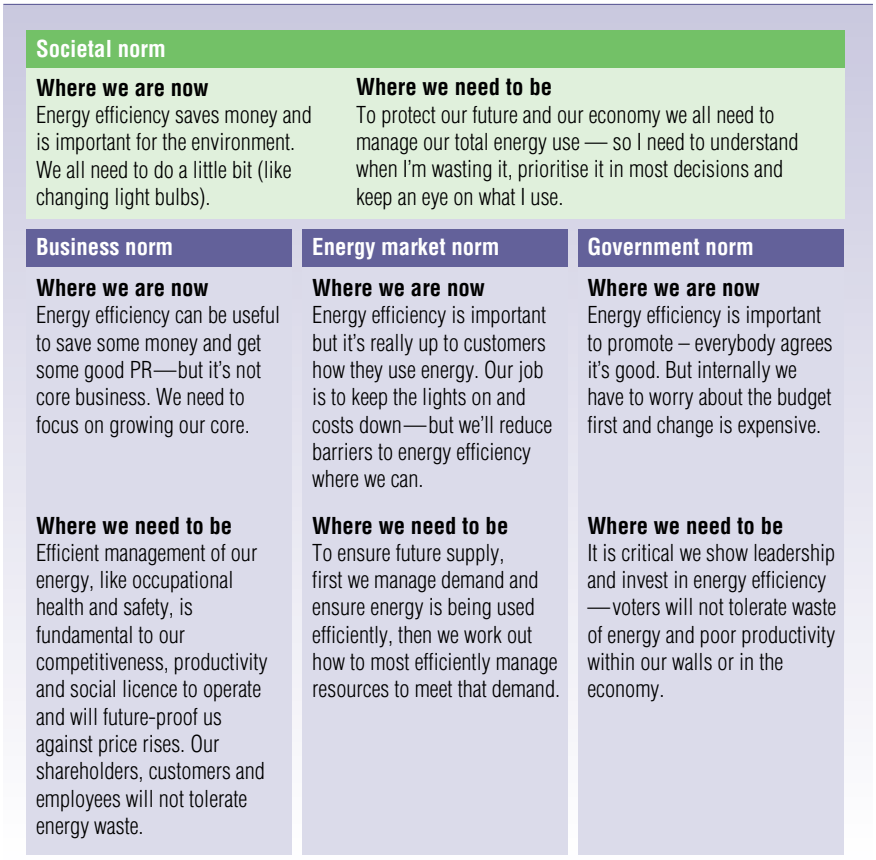
Leadership and societal norms are recognised in behavioural theory as drivers of change. The expected approval or disapproval of behaviour by respected individuals and groups (peer beliefs) is a key consideration that influences whether or not a person will undertake a specific behaviour.[14] People tend to model their own behaviour on those whom they respect, aspire to emulate or seek to compete with.

In this sense, leadership can occur at all levels of the community — from influential business decision-makers, politicians and celebrities to local businesses, community groups, schools and neighbours.

Supporting and encouraging leadership at all levels of society can encourage new societal norms. The Task Group was advised frequently in consultations that demonstration of Australian Government engagement in its own energy efficiency activities would be expected as a means of underpinning its leadership role. This is discussed further in Appendix I.

Figure 7.2 provides an illustration of the kind of shift in expectations and/or norms that might be required in order to achieve a sustainable step change in Australia's energy efficiency performance.

Figure 7.2 What could a shift in the societal norm look like?



Recent Australian water conservation efforts (which have achieved up to 60 per cent reductions (Box 7.2)) and recycling programs show successful examples of consumer engagement and social marketing strategies achieving a clear shift in societal norms relating to sustainability. A wide range of campaigns — on quitting smoking, skin cancer prevention ('Slip Slop Slap'), AIDS prevention, road safety and occupational health and safety ('Home Coming'), for example — also demonstrate how to achieve high-impact sustained change to societal norms with longer-term programs that utilise the full spectrum of engagement, education, incentives and regulation.

Box 7.2 Brisbane water demand management—changing the societal norm[15]

In considering the capacity of Australians to change and then maintain new behaviours, the recent urban water demand management campaigns, particularly in Brisbane, provide useful examples. During the recent sustained drought, Brisbane water users demonstrated a shift in use from 300 litres per person per day before the drought to below 140 litres — a drop of around 55 per cent.

What caused this change? Initial motivation was likely driven by a compelling call to action — the very visible drought. The supporting engagement strategy was holistic, and included watering restrictions; an aspirational target that was widely monitored and reported; personalised benchmarks on water use (called the Separate Water Advice); a range of incentives and supporting services such as water tank rebates and replacement shower heads; and a range of community and business-initiated activities, such as green gardening tips.

Most of the change has been maintained since water restrictions have been relaxed and the drought has visibly broken, with current usage around 150 litres per person per day. As a result, Queensland Water has reduced its long-term usage target for planning infrastructure to 230 litres per person per day. This indicates that shifts in societal norms can be achieved.

Much of the credit for the change was given to the Separate Water Advice and target, which provided a competitive sense of comparison and community effort. Surveys on the effectiveness of the Separate Water Advice showed that 73 per cent of residents said they 'always' read the bar chart comparing their average to their local area average, and 58 per cent said they actively used this information to manage their water consumption. Almost three-quarters (71 per cent) said they discussed the information with fellow household members and more than half (58 per cent) discussed it with family, friends or work colleagues.

State energy efficiency awareness campaigns, such as LivingSmart in Western Australia (Box 7.3), suggest that a well-designed and well-researched consumer engagement strategy can have an impact. But it also requires a strategic and holistic approach to behaviour change — consistently coordinated across all relevant policy and programs, incentives and regulations, not just information campaigns and mass-media marketing. It is unlikely that a communications campaign, in the absence of other measures to support and encourage behaviour change, would be enough to drive a normative change. It is critical to align supporting Commonwealth and state policies such as labelling, grants and subsidies.

It is unlikely that a communications campaign, in the absence of other measures to support and encourage behaviour change, would be enough to drive a normative change.

Recent evidence from state experiences suggests that most consumers (around 80 per cent) believe government should be taking the lead in applying these kinds of approaches to energy efficiency.[16] There was strong support for a national approach to engagement and behaviour change during the Task Group's consultations.

Box 7.3 What encourages consumers to improve their energy efficiency?

Bill benchmarking alone in the United States has been shown by Positive Energy to result in an average of 2.5 per cent reductions, across 10 separate utilities.[17]

A similar US study by Opower, collaborating with a California utility to send home energy reports to consumers comparing them to an 'average', reported just under 2 per cent average impact.[18]

A Canadian information-only trial of smart meter displays run by Hydro One, which increased awareness of energy use (through a real-time screen) without applying a price signal, measured a 6.5 per cent decrease in average energy use.[19]

A US-wide Electric Power Research Institute report suggests that residential customers with access to direct feedback about their energy use reduce their energy consumption by between 4 and 20 per cent.[20]

The Townsville Solar City on Magnetic Island has demonstrated, to date, a 9 per cent reduction in average electricity consumption and a 24 per cent reduction in peak demand (with education and subsidies but no price signal).[21]

TravelSmart — a personalised marketing approach to encourage use of sustainable transport options — has demonstrated reductions of 10 per cent of car trips and 13 per cent of car kilometres across the suburbs in which it has been implemented.[22] It has been successfully implemented in targeted programs across Western Australia, Queensland, South Australia, Victoria and the Australian Capital Territory.

Western Australia's Living Smart Household, currently being delivered to 10,000 households in Perth's eastern region as part of the Australian Government's Perth Solar City initiative, extends the TravelSmart approach to household energy and water usage, waste generation and car travel. Results from pilot projects show participating households achieving large reductions in greenhouse gas emissions (estimated at around 1 tonne CO_2-e abatement per household per annum, or a more than 8 per cent reduction) from small improvements in their energy, water, waste and travel efficiency.

7.2 Existing measures

A wide range of existing energy efficiency measures — state and Commonwealth — seek to influence consumer behaviour, some of which have demonstrated quantifiable achievements. They include:

- energy rating labels on some appliances and vehicles
- energy efficiency awareness campaigns led by various states, such as Victoria's 'Black Balloons' campaign (which has since been expanded by South Australia and New South Wales) and ClimateSmart in Queensland
- local engagement programs, such as TravelSmart and Cool Communities
- new information sources, such as the LivingGreener website and the Green Vehicle Guide
- programs supporting energy audits
- grants and subsidies (for example, for new solar hot-water systems).

However, these measures do not constitute a coherent effort. They are often technical, inconsistent and difficult to compare. They are generally directed at driving a specific activity and, to date, have not focused on total consumption. Accordingly, they do not assist consumers in making comprehensive evaluations or managing their options. Neither have they tended to link to a clear narrative about the utility of wider change or to build consumer ownership of change. The approach suggested in section 7.3 would seek to harness and enhance the benefits of these existing measures through improved consistency, coherence and collaborative national leadership.

7.3 Recommendations to facilitate an energy efficiency culture

The Task Group recommends that the Australian Government consider the development of a holistic approach to national energy efficiency engagement that is large scale, consistent and long term.

Such an engagement strategy would:

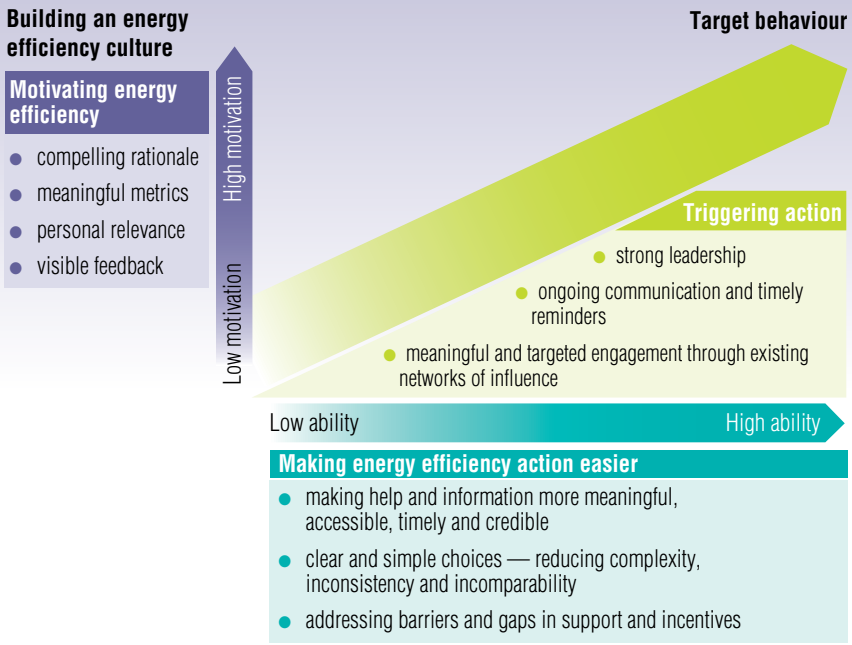
- target change across all energy consumer sectors — households, communities, businesses and industry
- take a partnership approach to implementation and be collaborative, to align action at all levels of government, business and the community
- review and refine existing related programs — such as labelling, grants and subsidies — to reduce complexity and ensure a coherent and simple message.

The strategy would need to be seen, and be treated, as nonpartisan and allowed to run over the medium term, irrespective of the stage in the electoral cycle (for example, the most effective health campaigns have been maintained over more than 10 years). Were the strategy to be perceived by the community as a politically contested space, the likelihood of success would be much reduced. It would also require an empirical research approach to social marketing and an intensive initial design phase (likely six months) to ensure effective impact.

The core of any new approach should be to provide a coherent framework for change, described in Figure 7.3, covering three drivers:

- motivating energy efficiency
- making action on energy efficiency easier
- triggering action through ongoing community engagement.

Figure 7.3 A framework to build an energy efficiency culture



Source: Based on BJ Fogg, *A behavior model for persuasive design*, Persuasive Technology Lab, Stanford University. See www.captology.stanford.edu and www.behaviormodel.org.

Motivating energy efficiency

This first driver addresses the clearest existing gap — making the benefits of energy efficiency and the costs of inaction relevant to individuals, visible and tangible. To be effective, such an approach should include:

- *A compelling rationale and call to action*: This encourages people to do their part within a framework where everyone's actions will make a difference. The rationale needs to be carefully framed by research, as people act for a range of different reasons — cost savings, climate change, welfare, security, and so on. Such a rationale could be consistent with a national energy efficiency target.
- *Simple, consistent and meaningful language or metrics*: Technical and inconsistent language currently makes energy use intangible and activities difficult to compare. A non-technical and visible language for energy use (like the star rating or black balloons) should be used consistently across all measures.
- *Individually relevant feedback*: The call to action should have personal relevance, through, for example, benchmarking (Box 7.4) and real-time monitoring.[23]
- *Visible rewards for action*: Role models and leaders should be supported (Box 7.1), underlining that energy-efficient behaviour is 'normal' and desirable.

Box 7.4 Current commitments to electricity bill benchmarking

Bill benchmarking has proved highly effective at making general messages relevant to individuals (see Box 7.3). These benchmarks compare a consumer's use to a relevant community average or efficient user, providing materiality to the volume of energy and targeting both a sense of the norm ('Am I a low- or a high-energy user?') and local competitive attitudes.

The Ministerial Council on Energy is currently implementing a regulatory requirement for electricity retailers to provide simple 'local average' benchmarks on consumer electricity bills. This was originally a commitment under the National Framework for Energy Efficiency. The final Regulation Impact Statement has recently been approved; this requirement will be in law by the end of 2010 (applying in different jurisdictions between 2011 and 2013[24]).

As part of a new national approach, bill benchmarking could be significantly improved: consumers could see how their personal use compares to both a local norm and an 'efficient user' in a simple language or metric that they can easily compare to many options to reduce their use. Benchmarks could also be extended to gas bills and annual vehicle usage.

Making action on energy efficiency easier

Any new approach should review the full range of existing programs — including jurisdictional measures, incentives and regulations — and undertake detailed consumer research to identify gaps, inconsistencies and possible improvements. Examples of possible gaps and improvements likely to have a high impact and be cost-effective include:

- expansion of point-of-decision information and labels — for example, through better retailer training, product coverage and comparability, and introduction of a simpler endorsement label where appropriate
- streamlining existing web information and promoting more effective web services
- addressing gaps in support for small businesses
- addressing credibility issues for service providers.

The CarbonKids Program really motivated the students. It made them aware of the impact they were having on climate change, but particularly opened their eyes to the whole community impact on the issue. The biggest outcome was that they realised they could make a difference and that the community was listening to them, and paying attention to what they had to say.

Shane Doherty, Principal, Bunbury Primary School

Triggering action through ongoing community engagement

The final priority for any new approach should be to ensure that individuals and the community maintain the sense that energy efficiency is important and that this translates to action at the time decisions are being made. For permanent change this would require sustained momentum over a long timeframe and a wide range of engagement activities to promote awareness.

These activities could include some form of large-scale approach for essential awareness raising and education and to launch any central vision or language/metric/mnemonic. Comparable campaigns have shown high impact — the NSW black balloons campaign demonstrated an increase in a range of energy efficiency behaviours of up to 13 per cent (self-reported) between 2009 and 2010.[25]

But any new approach to energy efficiency engagement should go well beyond traditional communications and focus on more targeted strategies such as partnerships with community and business networks; school and higher education strategies; and Web 2.0 activities. These targeted mechanisms have often proved more effective in driving action (as opposed to raising awareness). Successful examples including TravelSmart (see Box 7.3), CarbonKids (see Box 7.5), and the GST Start-up program (delivered through the Institute of Chartered Accountants and the Australian Society of Certified Practising Accountants).

Box 7.5 CarbonKids

A 2009 pilot by CSIRO of the CarbonKids schools program demonstrated benefits to schools, teachers, students and local communities that well exceeded expectations.[26] This pilot engaged 26 highly diverse schools, involving 3,751 students (grades K–10) and 103 teachers. Its approach focused on outcomes for action by individual students and schools showing community leadership. It involved a wide range of engagement including teacher education; curriculum development and resources; 'scientists in schools' visits; carbon calculators and energy reductions for schools; sustainable transport choices for schools (like 'walking buses'); and planting and carbon sequestration activities.

7.4 Expected outcomes for consumers and business

Programs addressed at changing norms in behaviour in Australia and overseas have demonstrated a range of energy efficiency improvements between 2 and 15 per cent (see Box 7.3). These programs reduce costs to users with minimal investment required beyond the cost to government of the programs.

Increasing energy efficiency engagement would also give consumers greater flexibility in managing future energy price rises, increase individuals' understanding of their impacts on climate change and the role of communities and individuals in the transition to a low-carbon economy. This approach would be complementary to a carbon price.

7.5 International precedents

Many countries implement a range of energy efficiency engagement programs, which vary in scope and approach. International programs that have had a demonstrated impact include bill benchmarking in the United States, energy display monitoring trials in Canada, carbon schools programs in Europe, and labelling in Japan, New Zealand, the United Kingdom and the United States.

The United Kingdom provides a further example of a holistic approach in its 'ACT ON CO_2' campaign.[27] Launched in 2007, the campaign seeks to engage the public on climate change issues and encourages individuals to take steps to reduce their carbon footprint. It is a cross-government initiative, which seeks to cut through the cluttered landscape of climate change communications and address the confusion that surrounds the issue by providing clear, factually correct, consistent information and strong government leadership on the issue.

7.6 Expected benefits and costs

Expected change in energy and emissions

Comparable behavioural change measures in energy (without a price signal) in Australia and internationally have resulted in a 2 to 15 per cent reduction in energy use by consumers. But estimating savings in these programs is difficult, as it depends not only on the effort applied but the effectiveness of a particular measure's design. Quantifying additionality to other measures — such as any national energy savings initiative (chapter 4) or minimum standards (chapter 14) — is also difficult, although improved engagement in energy efficiency would maximise impact and take-up of these supporting measures.

Implementation costs and complexities

There would be some changes to existing regulatory industry costs — such as labelling and bill benchmarking. However, net impacts should be low as many of these costs are substitutes or revisions of existing activities. Government investment could leverage some matched investment, particularly in the partnerships programs with media, communities, schools and business networks, and states and territories should be expected to contribute as part of aligning with their existing activities.

Economic costs

Given that the response to any new engagement measures would be voluntary and would likely result in savings in the medium term, the net impact on wellbeing is likely to be positive.

Notes

1 According to the Australian Bureau of Statistics (ABS), in *Environmental views and behaviour, 2007–08*, 90 per cent of consumers are taking action.

2 S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, November 2009.

3 ABS, *Household expenditure survey, 2003–04*.

4 ABS, *Energy survey 2001–02*.

5 Provided by the Department of Climate Change and Energy Efficiency, based on modelling for the Carbon Pollution Reduction Scheme.

6 Department of Climate Change, National Greenhouse Gas Inventory by economic sector 2007.

7 For example, due to improved minimum standards, a new refrigerator in 1980 generally used about three times the energy of its modern, bigger counterpart. See www.energyrating.gov.au.

8 This is supported in an extensive range of market research. Two examples:

Environmental views and behaviour, 2007–08: Nine in 10 people reported that they took steps to limit their electricity use in the year prior to the survey; nearly half (47 per cent) reported that they thought their personal electricity use had decreased, with a similar proportion (45 per cent) reporting that their personal electricity use had not changed. Evidence from energy bills confirms that in most cases household use has increased.

Red Jelly focus groups for the *Smart Meter Cost Benefit Analysis 2007:* 'Where some consumers received a higher electricity bill than normal the general reaction appears to be to automatically assume that the cost of electricity has increased.' 'Low income earners were strongly convinced that electricity has constantly been increasing in price over the last few years in WA (despite reality of no price increase since 1996).' 'All groups believed the cost of electricity … regularly increased based on the cost of their bills.' (Report to the Ministerial Council on Energy, www.ret.gov.au/Documents/mce/emr/smart_meters/default.html.)

9 Winton Sustainable Research Strategies Pty Ltd, *A summary of the OSGS product development (quantitative and qualitative)*, report for the Department of the Environment, Water, Heritage and the Arts, 2008.

10 National Greenhouse Gas Inventory by economic sector 2007.

11 Analysis by the Department of Resources, Energy and Tourism in the context of management of the Energy Efficiency Opportunities program.

12 S Asch, 'Opinions and social pressure', *Scientific American*, vol. 193, 1955, pp. 31–5; S Bikhchandani, D Hirshleifer & I Welch, 'Learning from the behavior of others: Conformity, fads, and informational cascades', *Journal of Economic Perspectives*, vol. 12, 1998, pp. 151–70.

13 E Rogers, *Diffusion of innovations*, 5th edn, 2003.

14 A Bandura, 'Personal and collective efficacy in human adaptation and change', in JG Adair, D Belanger & K Dion (eds), *Advances in psychological science, vol. 1: Personal, social and cultural aspects,* Psychology Press, UK, 1998, pp. 51–71; I Ajzen & M Fishbein, 'The influence of attitudes on behaviour', in D Albarracín, B Johnson & M Zanna (eds), *The handbook of attitudes*, Erlbaum, 2005, pp. 173–221.

15 Water demand management has been successful in changing norms in a wide range of jurisdictions and bill benchmarking has also been used in many other areas, including Melbourne. Brisbane has been chosen as an example because of the extent of change there and available evaluation. Details are sourced from the Queensland Water Commission at www.qwc.qld.gov.au.

16 NSW Department of Environment, Climate Change and Water, 'Who cares about the Environment in 2009?', www.environment.nsw.gov.au/community/Whocares2009.htm.

17 Energy Consult, *Energy bill benchmarking: Decision Regulatory Impact Statement,* March 2010.

18 Smart Meter Cost Benefit Analysis—Consumer report: NERA, 2008, www.ret.gov.au/Documents/mce/emr/smart_meters/default.html.

19 Smart Meter Cost Benefit Analysis, 2007.

20 Energy Consult, 2010.

21 Department of Climate Change and Energy Efficiency, Solar Cities internal program reporting.

22 WA Department of Public Transport submission to the Task Group; www.travelsmart.gov.au.

23 As supported through Queensland's ClimateSmart program and a range of Smart Meter pilots and trials. Impact demonstrated in a range of overseas trials, including the HydroOne information-only trial in Canada, which measured 6.5 per cent energy reductions through in-home displays without a price signal.

24 As part of the National Customer Energy Framework under development, to be finalised by the end of 2010, www.mce.gov.au.

25 NSW Department of Environment, Climate Change and Water, in its analysis of the impacts of the 'Black Balloons' campaign, has reported that the level of energy-efficient activity has increased; there has been a 13 per cent increase in activity across 10 'everyday' energy-efficient behaviours that people say they do 'mostly' (from an average of 6.2 behaviours to an average of 7.0 behaviours); and there was higher reported participation in energy-efficient actions promoted in the campaign by people who had seen the advertising (7 to 12 per cent higher participation for five specific behaviours such as energy-efficient clothes washing and drying and adjusting heating/air-conditioning).

26 An independent evaluation by Renshaw, Hitchen & Associates in 2010 found that by the end of the pilot, student knowledge had increased significantly in relation to knowing practical things they could do every day to reduce carbon and greenhouse gases at school and at home; students had learnt more about climate change; and students' attitudes and behaviours had shifted towards greater awareness of the impact they can have on biodiversity and energy consumption. Schools involved in the pilot show strong enthusiasm and plan to continue CarbonKids in their curriculum. The planned next stage involves 200 schools, largely in rural communities, but is yet to be funded.

27 'ACT ON CO_2' involves the Department of Energy and Climate Change, the Department for Transport, the Department for Environment, Food and Rural Affairs and the Department for Innovation, Universities and Skills. Government-funded bodies such as the Energy Saving Trust and the Carbon Trust are also involved and there is a list of more than 30 branded business partnerships. This collective approach aims to demonstrate the UK Government's commitment to taking action on climate change, working with businesses and individuals in order to reduce CO_2 emissions. See actonco2.direct.gov.uk/actonco2.

Building on the foundations

Large energy users

A balanced mix of information, regulation and incentives could help improve the energy efficiency of Australia's largest energy users and contribute to a step-change improvement in Australia's energy efficiency.

Australia's 200 largest energy-using corporations use some 30 per cent of Australia's primary energy. These corporations have identified energy savings of around 7 per cent under the Energy Efficiency Opportunities program. However, there remains a clear gap between what is currently viewed as an economically cost-effective energy efficiency investment and what businesses actually invest in.

This chapter outlines three opportunities for improving the energy efficiency of large energy users:

- providing better information to decision-makers by expanding the coverage of the Energy Efficiency Opportunities program to the energy generation, transmission and distribution sectors; reviewing and enhancing the program's assessment and verification requirements and capacity building recognition tools; and requiring proposed substantial greenfield and expansion projects to assess and report on energy efficiency opportunities at the design and commissioning phase
- providing incentives for longer-payback investments through a national energy savings initiative (as well as an explicit carbon price)
- developing and demonstrating new step-change technologies and processes through a targeted and comprehensive energy efficiency research, development and demonstration strategy.

Australia's 200 largest energy-using corporations represent a substantial and growing proportion of Australia's energy and greenhouse gas emissions. These corporations consume 1,775 petajoules of energy, which is 45 per cent of Australia's final energy use or 30 per cent of Australia's primary energy use (Figure 8.1). This is more than Australia's household (around 18 per cent) and services sectors (7 per cent) combined. The 'top 20' energy-using corporations alone use more energy than all Australians use in their houses and cars.[1]

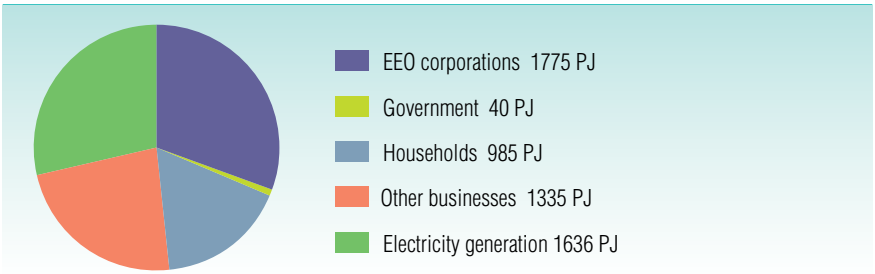
Around 30 per cent of Australia's primary energy is used to generate electricity, while 8 to 10 per cent of electricity is lost during distribution and transmission.[2]

Even small energy efficiency gains across the 200 largest energy users, and across energy generation, distribution and transmission, would result in substantial gains for Australia overall.

Primary energy use by Australia's manufacturing and mining sectors is projected to grow by 66 per cent between 2007–08 and 2029–30.[3] Mining energy use is projected to grow by 6.1 per cent per annum over the same period due mainly to growth in the export-oriented mineral processing and gas subsectors.

Even small energy efficiency gains across the 200 largest energy users, and across energy generation, distribution and transmission, would result in substantial gains for Australia overall.

Figure 8.1 Primary energy use in Australia, 2007–08



Source: Department of Resources, Energy and Tourism, *First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program*, 2010, p. 7.

8.1 Existing measures for large energy users

The Energy Efficiency Opportunities program was introduced in 2006 and requires Australia's largest energy-using corporations to identify energy efficiency opportunities and report on their implementation. The program is designed to remedy information failures that prevent the optimal uptake of cost-effective energy efficiency opportunities. Program participants comprise around 80 per cent of final energy use in the mining and manufacturing sectors (which are dominated by a relatively small number of large corporations), but a smaller proportion of energy use in the transport and services sectors (which contain a high number of smaller corporations).

The Energy Efficiency Opportunities program is still relatively new. However, in December 2009, 197 corporations reported that they had collectively identified around 90 petajoules in energy efficiency savings with less than a four-year payback. This represents some 7 per cent of the corporations' total assessed energy use; 2.9 per cent of Australia's energy end use; and an estimated 1.5 per cent of Australia's greenhouse gas emissions.[4]

Identified savings ranged from of 12.3 per cent of energy use for the services sector to savings of 4.9 per cent for the transport sector.

Corporations identified opportunities that return net financial benefits in excess of $730 million per annum, and are currently implementing some 60 per cent of these opportunities.[5]

Comprehensive assessments are resulting in improved identification and take-up of low-cost opportunities, especially those with less than a two-year payback. The mid-cycle review of the Energy Efficiency Opportunities program (yet to be finalised) is indicating a significant shift in the management and accountability for energy efficiency. However, implementation remains an issue, with competing priorities for capital, resources and senior management attention.

Energy Efficiency Opportunities participants are required to identify, evaluate and report publicly on cost-effective energy savings opportunities to a regulated standard (in a form accessible by, and readily available to, the general public). This enables corporations to keep track of where cost-effective energy efficiency improvements might be found across their industry.

The National Strategy on Energy Efficiency committed to 'continue an enhanced Energy Efficiency Opportunities program and extend elements of the program to smaller users'.[6] The Department of Resources, Energy and Tourism is currently investigating non-regulatory options for how the information elements of Energy Efficiency Opportunities could usefully be extended to smaller energy users.

The New South Wales, Victorian and Queensland governments also have mandatory assessment programs that cover large and smaller energy users.

'Time and again, industrial energy efficiency has been demonstrated to be cost effective while having a positive effect on productivity.'

8.2 The challenge for large energy users

Businesses can improve their energy efficiency by optimising existing production processes or investing in currently cost-effective energy-efficient technology. While individual changes are often incremental, the review of the Energy Efficiency Opportunities program demonstrated that, in some specific instances, energy efficiency improvements resulting in greater than 30 per cent reductions in energy use can be achieved.[7]

Yet, notwithstanding the opportunities identified under the program, there is a clear gap between what is currently viewed as economically cost effective and what business actually invests in — due in part to competing priorities for capital and resources and in part to information gaps, culture and awareness levels. The challenge is to make energy efficiency improvement a similar priority to production improvement.[8]

> Time and again, industrial energy efficiency has been demonstrated to be cost effective while having a positive effect on productivity. Despite this, energy efficiency improvements with very favourable payback periods often do not get implemented. Even projects that are implemented may not be sustained due to lack of supportive operational and maintenance practices. Energy efficiency is still viewed during hard times as a luxury that industry can't afford, rather than a strategic investment in future profitability. Energy efficiency is not integrated into daily management practices.[9]

Industrial energy efficiency is impeded by a range of factors, including:

- lack of skills and expertise
- failure to invest in efficiency, partly due to a lack of experience with the benefits of energy efficiency
- organisational and decision-making structures (for example, the parties with relevant knowledge do not have access to decision-makers)
- budgeting processes (for example, energy efficiency projects are only funded through the 'maintenance' budget and cannot access 'development' budgets, despite potentially delivering better returns on investment than development investments).[10]

8.3 Mechanisms for addressing the challenge

The Government has three key mechanisms available to influence large energy users' decisions: information, regulation and incentives. Information will ensure that decision-makers are aware of cost-effective energy efficiency opportunities. Regulation may be needed to overcome businesses' cultural impediments, or other barriers to energy efficiency improvement. Incentives can play a role in raising the 'ceiling' in terms of implementing higher-risk, innovative step-change technologies and processes.

Experience from the Energy Efficiency Opportunities program review, perspectives gleaned from the Task Group's consultations, and issues raised in discussions with individual companies indicate that care needs to be taken in selecting a mix of these mechanisms to achieve energy efficiency improvements and embed energy efficiency in the decision-making culture of our large energy users. Currently, businesses are often oriented towards increasing output in the first instance, and avoiding costs after that. Reducing production costs, such as energy bills, can be less salient for decision-makers. An integrated strategy would be required to change this cultural tendency and increase decision-makers' focus on energy efficiency.

> The key goal of policymakers is to foster behavioural change that avoids unnecessary energy consumption and provides consumers with the necessary information to make rational choices on the use of appropriate materials, technology and modes of energy consumption … as well as dealing with market, cost, regulatory and other barriers that prevent consumers and industry from taking up energy efficiency opportunities that could be cost effective in the medium- to longer-term as opposed to the short term. Long-term certainty on the regulatory framework — including certainty that regulatory arrangements do not impose costs that impair the trade competitiveness of EITE firms — and incentives for major investments in energy efficiency projects will be important to encouraging energy efficiency improvements beyond the incremental.
>
> Bureau of Steel Manufacturers of Australia submission to the Task Group

Providing better information for decision-makers

An important first step would be to improve the quality and accessibility of information to decision-makers and increase the salience of that information. The efficacy of such an approach has been demonstrated through mandatory assessments under the Energy Efficiency Opportunities program, state programs and industry-led initiatives, which are improving the information available on, and the take-up of, low-cost energy efficiency opportunities.

Box 8.1 Nyrstar, Port Pirie — a case study[11]

Nyrstar, Port Pirie is an integrated multi-metal smelter and refinery with an annual energy spend of $50 million. Energy makes up around 30 per cent of operating costs. The site's business improvement manager embraced the Energy Efficiency Opportunities program and undertook a thorough assessment including workshops involving over 180 personnel, which generated 300 ideas for saving energy. A rigorous energy–mass balance of the 100-year-old site's 200-plus energy flows revealed that a third of the site's energy use could be recovered. Initial ideas were condensed to 190 possible opportunities. The first 17 projects under investigation are projected to save $5.5 million (11 per cent) of annual energy costs, 0.21 petajoule of energy, and 3,800 tonnes of greenhouse gas emissions per annum.

At an Energy Efficiency Opportunities workshop, the then business improvement manager noted that:

> One of the benefits of [the program] is that it gave us a chance to look at our processes from a different point of view. The rigour required was very good for us because we hadn't had a focus on the energy component of the process; it was always about the metallurgical side of the business. We decided that we had to invest in data collection up front so that we could work out where we could save the most energy. We learned a lot about how energy is used in different parts of the process.

Providing incentives for long-payback investments

Projects aimed at reducing energy costs that require large capital or longer than two-year paybacks often have difficulty competing with core business projects aimed at increasing production or reducing license-to-operate risks. In many cases this may simply reflect lower rates of return for energy efficiency projects. However, there may also be higher hurdle rates associated with energy efficiency projects, particularly if they are seen as novel, and hence more risky, for businesses. There may also be a cultural bias within companies towards core business projects.

While the Energy Efficiency Opportunities program is encouraging identification and implementation of energy efficiency investments with shorter payback periods, a well-designed and well-targeted national energy savings initiative could leverage investment by large energy users in capital projects with longer paybacks. In the absence of an energy savings initiative or an explicit carbon price, a significant increase in long-term energy efficiency improvements would require an alternative form of substantial incentive (for example, a grant, subsidy, levy and refund scheme, or some form of mandatory obligation to improve energy efficiency). It has been suggested that some previous measures that have attempted to address this issue (such as the Greenhouse Gas Abatement Program) failed to take into account the timeframes and complexities involved, and while having appropriately high threshold requirements, delivered disappointing results in terms of emissions abatement.

Developing and demonstrating new energy efficiency step-change technologies and processes

Risk and uncertainty surrounding the development and adoption of new energy efficiency step-change technologies or processes can constitute a serious barrier to implementation. Risk aversion frequently creates demand for existing rather than more efficient technologies. This can be exacerbated in industries, such as the Australian mining and minerals processing industries, that are expanding rapidly and have tight timelines to put in place new plant and equipment. In the case of totally new energy efficiency technologies and processes there can also be a first-mover disadvantage, with the first company to trial or demonstrate the project bearing all the risk, while its competitors potentially benefit from the knowledge gained.

In the absence of a strong carbon price, achieving a further step-change improvement in energy efficiency through technological change would require government support for the research, development, trialling and testing of new technology and the dissemination of measured results.

Box 8.2 The Australian CO_2 Breakthrough Program[12]

The Australian iron and steel industry produces about 8 million tonnes of steel and 14 million tonnes of greenhouse gases (mostly CO_2) each year. Most of these emissions occur during production of hot metal from iron ore/sinter in the blast furnace, where coal and coke are used as fuel and reductant.

Since 2006, the Australian steel industry (BlueScope Steel and OneSteel) and CSIRO (Minerals Down Under Flagship) have been collaborating under the Australian CO_2 Breakthrough Program. They have invested around $7 million to develop breakthrough technologies for reductions in net emissions from the industry. This R&D program covers two focus areas — biomass and dry granulation of slags — which, if successful and implemented, could more than halve the greenhouse gas emissions from the industry. Waste heat recovery and utilisation of energy derived from by-products through cogeneration are strong features of the technologies under development. Furthermore, the technologies under development could be in widespread implementation in three to seven years' time, once the R&D is completed with successful outcomes and they are demonstrated through full-scale plant trials at Australian steel plants.

While good progress has been made to date, demonstration of these technologies is being hindered by a lack of capital investment in large-scale plant trials.

Barriers addressed

Better information for decision-makers would help remedy information failures, bounded rationality and organisational barriers and would lower transaction costs in the longer term as energy efficiency improvements progressively enter the mainstream.

A well-designed energy savings initiative could deal with barriers such as the priority given to energy efficiency (particularly projects requiring substantial capital or longer paybacks), bounded rationality, competing priorities for capital, and low-risk adjusted returns (see Box 8.3).

Box 8.3 Barriers to capturing energy efficiency from large energy users[13]

There are a range of barriers to implementing energy efficiency measures, including:

- low awareness and attention from senior management at industrial companies
- low skill level on-site to undertake energy analysis
- low prioritisation of energy management, resulting in limited investment in developing the required technical expertise
- elevated hurdle rate — industrial sites generally receive very tight operational budgets and plant managers are encouraged to maximise production while keeping near-term costs low
- capital allocation pressures — capital allocation from internal sources faces strict capital budget constraints, with non-core projects (such as energy efficiency) competing for funding against core projects. Furthermore, corporations often separate plant operations and maintenance budgets from capital improvement budgets, creating an organisational challenge for energy efficiency efforts, as costs reside in one budget while savings reside in another. Finally, even if projects are attractive by internal standards, corporations may remain reluctant to raise debt for energy efficiency projects for fear of adversely affecting their balance sheets and credit ratings
- high transaction costs can include process disruptions
- concerns about reliability and safety
- procurement constraints — many procurement systems contain limited inventory, and typically focus on upfront cost rather than total cost of investment
- risk aversion frequently creates demand for in-kind rather than more efficient replacements.

Certainty about the energy efficiency policy environment is also important for decision-makers considering investments with long payback periods.

8.4 Policy options for large energy users

A combination of information, regulation and incentives is likely to be most effective in leading large energy users to implement energy efficiency measures ranging from the 'floor' (phasing out particularly energy inefficient equipment and practices) to the 'ceiling' (trialling and implementing innovative new energy efficiency opportunities).

An explicit price on carbon will provide a strong driver for increased investment in energy efficiency projects and activities.

Three other policy initiatives could in combination help achieve an improvement in the energy efficiency of Australia's large energy users. These would complement an explicit price on carbon because they are designed to overcome information, cultural and risk barriers to energy efficiency improvement.

Expanding coverage of the Energy Efficiency Opportunities program

The following changes to the Energy Efficiency Opportunities program would improve information delivery to a wider range of decision-makers on commercially cost-effective opportunities for large energy-using corporations:

- *Expand the coverage of the* Energy Efficiency Opportunities Act 2006 *to the energy generation, transmission and distribution sectors*. This would expand the coverage of the Act from around 30 per cent to some 60 per cent of Australia's primary energy use, extending greatly the number of companies actively looking for cost-effective energy efficiency opportunities.
- *Review and enhance the program's assessment and verification requirements and capacity building recognition tools*. This would improve the quality and reliability of information for decision-makers and the investment sector. It would ensure that information is in a form that is meaningful for decision-makers, driving engagement not just compliance. It would make it easier to compare energy efficiency between like businesses, and so drive decision-making on energy efficiency improvements. This process would also provide an opportunity to look at streamlining reporting requirements for participants.
- *Require proposed substantial greenfield and expansion projects to assess and report on energy efficiency opportunities at the design and commissioning phase*. This could result in higher transactions costs (likely to be negligible compared to the overall design and commissioning costs), but would ensure that cost-effective energy efficiency technologies and processes are not overlooked during the design phase (due to time pressures, risk aversion or information availability). Incorporating energy efficiency opportunities during the design and construction of greenfield and expansion projects is generally easier and more cost-effective than retrofitting in later years.

> It is in the project design stage (pre-feasibility and feasibility stages) where the energy footprint of developments are established. Once footprints have been agreed to, typically they are locked in during the construction of the plant. Subsequent changes are difficult to make and it may be several decades before an opportunity arises again for substantial change.
>
> Rio Tinto submission to Task Group

Developing incentive mechanisms

The Energy Efficiency Opportunities program requires large energy-using businesses to identify projects with a financial payback of up to four years. Almost two-thirds of the identified savings to date were in projects that had a less than two-year payback.[14] This accords with anecdotal evidence indicating that corporations focus on projects with short payback periods, often less than 12 months, due to commercial imperatives.[15]

Clearly a mature price on carbon is the key incentive. However, ahead of a mature carbon price, new government measures could be considered to substantially increase investment by large energy users in projects with longer paybacks or large capital.

An energy savings initiative could provide incentives to invest in energy efficiency improvements beyond a two-year payback.

In the absence of either of these mechanisms, another incentive mechanism might be required to leverage this investment — for example a grant, subsidy, levy and refund scheme, or some form of obligation to improve energy efficiency.

Including greenfield and expansion projects in the Energy Efficiency Opportunities program could help identify longer-payback investments for these projects. Other mechanisms for encouraging innovative technologies and practices in greenfield sites to achieve maximum commercial energy efficiency could be considered as part of any energy efficiency innovation pathway.

Improving our knowledge of energy efficiency opportunities

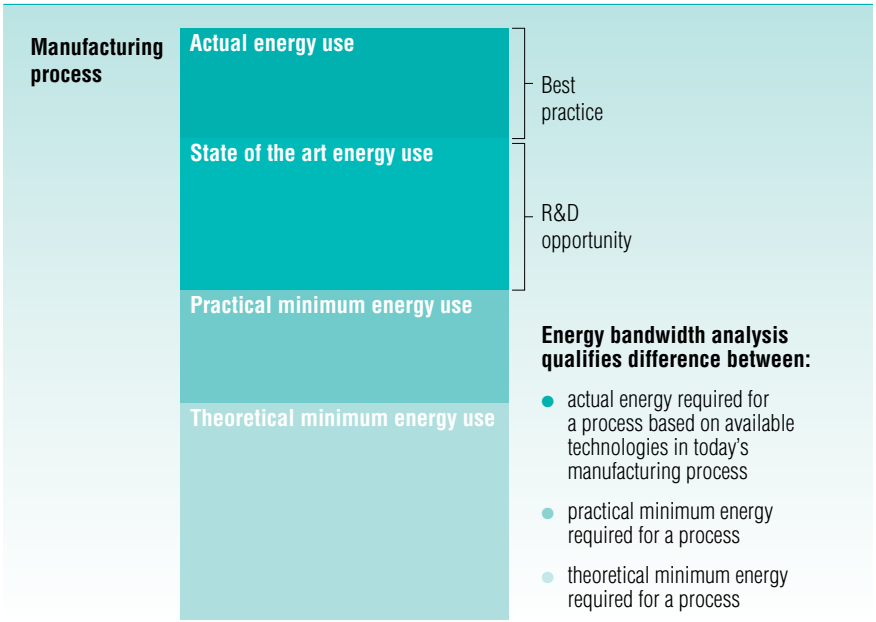
Research, development and demonstration strategy

For Australia to position itself as a leader in energy efficiency technologies, it would be important to consider the development of a targeted and comprehensive energy efficiency research, development and demonstration strategy. Any such strategy should be linked to international, national and sectoral collaborative efforts to improve the development and commercialisation of technology. It should focus on industries able to commercialise and capitalise R&D successes.

The innovation pathway (outlined in chapter 6) could identify the areas of greatest energy efficiency potential in the long term. This process would need to distinguish between the areas where Australian companies are best placed to lead technology development (for example, because a particular industry is expanding faster and in different areas in Australia than internationally), and the areas where Australian companies could be fast followers, adopting overseas technological breakthroughs.

As part of an innovation pathway, an energy bandwidth analysis could be undertaken in collaboration with key industrial sectors (see Figure 8.2). Energy bandwidth analysis is a method used by the US Department of Energy to provide a snapshot of the energy efficiency savings available through current best-available technologies and through further research and development.

Figure 8.2 Energy bandwidth analysis



Source: Based on B Prymak, 'Industrial energy efficiency', presentation by US Department of Energy, slide 12, February 2010, www.iacforum.org/iac/pdf/2010_Bill%20Prymak.pdf, accessed 8 July 2010.

Demonstration incentives

Research organisations such as CSIRO and industrial and mining cooperative research centres indicate that there is currently a gap in the level of investment in the trialling, testing and demonstration phase of industrial energy efficiency technologies. Large costs are often associated with trialling new technologies, particularly at plant level. There can also be first-mover risks, with later adopters benefiting from the lessons learned in the demonstration project.

Because of the inherent risks associated with demonstration technologies, it is unlikely that an energy savings initiative would provide funding in this area. To achieve a step change in energy efficiency the government could consider, over time, increasing its research and development assistance to target technologies that would particularly improve energy efficiency.

Such investment could be in the form of competitive grants to research bodies, suppliers and industrial corporations to support project funding to further investigate, test and establish the energy savings achieved at plant scale. By reducing the upfront costs associated with demonstration projects, such investment could reduce the risk associated with new technology adoption. In these trials, non-commercially-sensitive information on projects should be captured and disseminated to reduce technology adoption costs for other companies in the same industry (additional information on trials can be found in chapter 11).

8.5 Expected outcomes from large energy users

ClimateWorks Australia postulates that operational improvements to existing fossil fuel thermal efficiency (that is, without the need for infrastructure investment) would reduce energy use by 3 per cent for brown and black coal plants and 3.5 per cent for gas power plants.[16]

Up to 10 per cent of electricity is lost during the distribution and transmission process. ClimateWorks suggests that this could be reduced by some 1.5 percentage points — that is, loss reduction could achieve a 1.5 per cent decrease in electricity generation (equivalent to almost a year's growth in generator capacity).[17]

Expanding the coverage of the Energy Efficiency Opportunities program to greenfield projects could deliver substantial energy savings at these sites. McKinsey & Company and the US Department of Energy indicate that clean-sheet design could theoretically deliver very large improvements in energy efficiency.

> The 'theoretical' potential for efficiency reductions (i.e., as limited by thermodynamics) range from 43 to 95 percent [citation omitted]. Capturing the technological potential, however, would require a clean-sheet redesign of operations, because retrofitting these measures into existing facilities would be too costly.[18]

Reviewing and improving the effectiveness of Energy Efficiency Opportunities would identify further savings as corporations develop better metering, monitoring and data analysis skills, and improved information reaches key decision-makers.

The enhanced Energy Efficiency Opportunities program would be expected to maintain the energy savings rate identified to date by participating companies. Incentives under an energy savings initiative could encourage implementation of further longer-term energy efficiency projects.

Government support for trials and pilots could assist in developing an understanding of what improvements are realistic, and demonstrate where there is potential to achieve significant energy savings. Work by the US Department of Energy has found that practical minimum energy use is substantially lower than current energy use across a range of high-energy-use processes (with potential energy savings of over 50 per cent for the mining industry, almost 40 per cent for the pulp and paper industry, and between 23 and 54 per cent for the five principal petroleum refining processes).[19] More importantly, government investment could provide the foundation for major improvements in large energy-use industries and technologies from 2020, with demonstration technologies that are trialled between now and 2020 providing the basis for best practice industry standards beyond 2020.

8.6 International precedents

Countries including the United States, Canada and the United Kingdom assist their large energy users through voluntary agreements or subsidised energy assessments. The US Top 200 Assessments program, paid for by government, has delivered emissions reductions that are similar to those achieved under the Energy Efficiency Opportunities program (around 4 Mt CO_2-e). China (Top 1,000) and other Asian economies also mandate assessments of their largest energy users, with mandatory implementation.

The United States also funds energy bandwidth studies of energy-intensive industries to quantify the difference between actual performance, best available technology, practical minimum energy use and theoretical minimum energy use. Such an approach could be drawn on and integrated into the greenfield energy assessments.

Levy and refund or incentive initiatives for large energy users operate in the United Kingdom, Sweden and the Netherlands. In the United Kingdom, the levy and grants system achieved its 10-year sectoral energy reduction targets in less than two years. In the Netherlands, best practice stretch targets are set for industry sectors, and incentives are provided in the form of R&D assistance to help sectors achieve their goals.

8.7 Implementation

Expanding the Energy Efficiency Opportunities program would involve funding another five-year cycle and updating the legislation.

Government investment could provide incentives for corporations to implement longer-term opportunities under greenfield and existing site assessments. It would be important to work with the states to reduce duplication of measures and reporting burden.

8.8 Expected benefits and costs

Energy efficiency opportunities identified under the Energy Efficiency Opportunities program to date have the potential to return net financial benefits to participating companies in excess of $700 million per annum.[20] An expanded program would also be expected to provide an increase in net financial benefits.

Notes

1 Department of Resources, Energy and Tourism (DRET), *First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program*, 2010.

2 DRET, 2010.

3 A Syed, J Melanie, S Thorpe & K Penney, *Australian Energy Projections to 2029–30,* ABARE research report 20.02, March 2010.

4 DRET, personal communication, 2010.

5 DRET, *First opportunities.*

6 COAG, National Strategy on Energy Efficiency, July 2009, p. 7, www.coag.gov.au.

7 DRET, *First opportunities*.

8 It is important to note that energy efficiency improvements and production improvements are not necessarily mutually exclusive. A number of identified energy efficiency opportunities are production related. However, where there is perceived competition for investment, production improvements often seem to receive higher priority.

9 A McKane, Lawrence Berkeley National Laboratory, 'Improving industrial energy efficiency: Energy management and effective policies', presentation at the National Environment Agency, Singapore, 30 April 2010, p. 3, www.e2singapore.gov.sg/docs/Energy%20Management%20&%20Effective%20Policies.pdf.

10 B Paton, 'Efficiency gains within firms under voluntary environmental initiatives', *Journal of Cleaner Production*, vol. 9, 2001, pp. 167–78.

11 www.ret.gov.au/energy/Documents/energyefficiencyopps/PDF/Industry%20Case%20Study%20Nyrstar.pdf; www.ret.gov.au/energy/Documents/energyefficiencyopps/PDF/EEO2008WshopArticle-IndustryInsightsFINAL.pdf.

12 CSIRO submission to the Task Group.

13 McKinsey & Company, *Unlocking energy efficiency in the US economy,* 2009, pp. 80–1.

14 DRET, *First opportunities*.

15 McKinsey & Company, 2009.

16 ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010.

17 Syed et al., 2010: 'Gross electricity generation in Australia is projected to grow over the outlook period [2007–08 to 2029–30] by an average of 1.8 per cent a year.'

18 McKinsey & Company, p. 82; based on energy bandwidth studies of energy-intensive industries by the US Department of Energy and work done with client companies.

19 US Department of Industry, *Mining industry energy bandwidth study, pulp and paper industry energy bandwidth study, energy bandwidth for petroleum refining processes*, 2006.

20 DRET, *First opportunities.*

Transport

Improving the energy efficiency of the transport sector will be important for achieving a step change in Australia's energy efficiency performance. In the short and medium term, the largest opportunity for improving transport energy efficiency lies in improving the fuel economy and greenhouse gas emissions performance of our cars. However, beginning now to ensure our infrastructure, including public transport, can contribute to more energy-efficient travel will be important if we are to meet the longer-term challenges of climate change and energy security.

The Task Group proposes a strong approach to improving the fuel efficiency of our cars, including considering a mandatory light vehicle CO_2 emissions standard (currently the subject of a Commonwealth Regulation Impact Statement process) and a Commonwealth fleet emissions target.

As the share of freight transport in the transport sector is projected to increase, Australia's transport energy efficiency will come to depend more on sustaining the efficiency of our freight transport. One barrier to further improvements in road freight energy efficiency is the sizeable uncertainty about the energy and financial savings from capital-intensive energy efficiency investments. A priority area for future Commonwealth consideration should be to reduce this uncertainty, possibly by facilitating trials to evaluate low-emissions, energy-efficient technologies for heavy vehicles.

In a sector where long-lived assets determine the efficiency of the system, getting the right strategic policy settings in place for beyond 2020 is essential. Acting now to further improve the frameworks for transport infrastructure planning and appraisal, promoting energy-efficient urban mobility, and resolving issues around electric vehicle infrastructure will all be important to ensure energy efficiency gains.

Transport represents more than one-third of Australian final energy use,[1] and more than 40 per cent of all household emissions from energy use.[2] Around 90 per cent of Australia's transport energy and emissions come from road and rail passenger and freight transport.[3]

Overall, the energy efficiency of our transport system is determined by the efficiency of long-lived assets. Australian cars remain in the vehicle stock for an average of 20 years,[4] and transport infrastructure decisions made today will constrain or enable mobility for decades to come.

Improving the energy efficiency of Australian transport is both necessary and feasible. Improvements are necessary to meet overall energy efficiency and emissions reductions goals. Transport's contribution to Australia's final energy use means that the sector will be important in achieving a step change in overall energy efficiency. In turn, these improvements in energy efficiency are important for meeting longer-term climate change goals. International Energy Association (IEA) modelling indicates that, even with deep emissions cuts from all other energy sectors, if all modes of transport in every region of the world do not reduce their emissions significantly by 2050, stabilising the concentration of greenhouse gases in the atmosphere at 450 parts per million CO_2-e, a level agreed to be in Australia's national interest, will be 'very difficult'.[5]

This chapter begins with a description of Australia's current performance in light vehicle and freight energy efficiency, and discusses reasons for our performance, barriers to improved energy efficiency performance and measures undertaken to date to tackle these barriers. Overall, the analysis suggests that the largest opportunities for improving transport energy efficiency over the short and medium term lie in improving the efficiency of our light vehicles. The chapter then discusses the energy efficiency aspects of transport infrastructure, urban mobility and the emergence of electric vehicles. As longer-term issues, action here will not make a major contribution to a step change in energy efficiency by 2020, but is important to move Australia onto a more energy-efficient transport trajectory. Detailed descriptions of possible next steps for transport energy efficiency policy are at the end of the chapter.

Aviation represents a small share of transport energy use[6] and despite recent rapid growth[7] is expected to remain less than 10 per cent of our transport energy use in 2020.[8] This small share, and aviation's energy efficiency relative to that of passenger vehicles,[9] are the reasons that this chapter does not discuss aviation further.

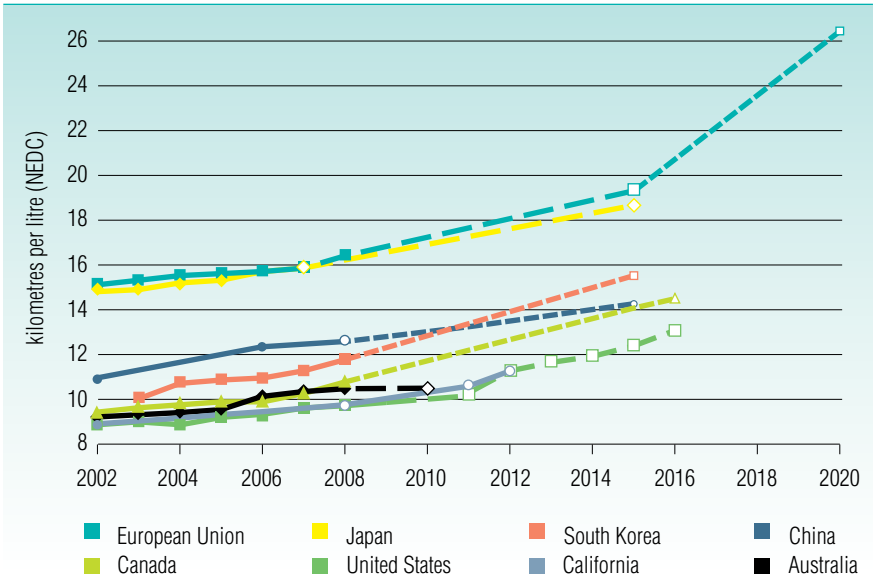
9.1 Energy efficiency in Australia's transport sector

In a 2006 survey of 19 IEA member countries, Australia had the least efficient road passenger transport,[10] and we have one of the lowest levels of new passenger vehicle fuel efficiency in the world (Figure 9.1).[11] This presents Australia with considerable opportunities for low-cost energy efficiency improvements: a range of experts here and internationally have shown that improvements in road passenger transport using existing technologies offer a low-cost way of reducing energy consumption and emissions in the short and medium term.[12] For example, the IEA estimates that if strong enough measures were implemented globally, the fuel consumption of new light vehicles could be halved by about 2030 at low or possibly negative cost to consumers, cutting emissions and improving energy security.[13]

In contrast with our passenger transport, Australian freight is energy efficient compared with that in other countries, mainly because distances and terrain permit greater use of more efficient modes and vehicles such as rail and long-haul trucks.[14] However, freight transport is expected to grow more strongly than passenger transport over the decades ahead — for example, over the period to 2020, freight transport is

projected to grow more than 50 per cent faster than passenger transport.[15] As the share of freight transport in the sector increases, Australia's transport energy efficiency will come to depend more on sustaining the efficiency of our freight transport.

Figure 9.1 Australia's new cars are some of the least efficient and the gap could widen



Note:

Solid shapes and lines show actual data.

Hollow shapes and lines show nearest targets enacted.

Smaller hollow shapes and smaller dashed lines show proposed targets

Data show actual or targeted future new passenger vehicle fleet average fuel economy for that year, under the New European Driving Cycle (NEDC) test cycle.

Source: International Council for Clean Transportation, 2010.

9.2 Current measures and barriers

There are a wide range of barriers to improving energy efficiency in the transport sector and these vary across users and modes.[16] While current policies, including measures under the National Strategy on Energy Efficiency, provide a foundation for addressing some of these barriers, there is scope to build on the National Strategy to drive further energy efficiency improvements, particularly in light vehicle energy efficiency.

Current measures and barriers to further improvements in light vehicle energy efficiency

Overall evidence suggests that improved light vehicle[17] fuel efficiency generally provides net financial benefits,[18] but the barriers to realising these benefits vary with the type of purchaser. Private buyers can lack the information and skills to estimate the financial implications of choosing a more fuel-efficient vehicle.[19] Business fleet buyers may not prioritise fuel efficiency as energy may be a relatively low share of their overall expenditures, while procurement requirements may affect the fuel efficiency of government fleets.

Australians who choose second-hand cars for price reasons face an additional barrier to choosing a fuel-efficient car. Second-hand vehicle buyers are constrained by the choices about fuel efficiency made by people who choose to buy new vehicles. Because around half of new vehicle purchases are for fleet vehicles,[20] improving the energy efficiency of fleet purchases is an important route to

making relatively rapid improvements in the energy efficiency of the Australian vehicle stock. Fleet vehicles are typically held for two to three years before being sold second hand, after which they stay in the vehicle stock for another 17 to 18 years.[21] This means that, even though individual fleets may be small, improving fleet vehicle efficiency can improve the efficiency of a large share of the overall vehicle market, benefiting both the original business and subsequent purchasers in the second-hand vehicle market.

In order to improve commercial fleet efficiency, fleet managers need a detailed understanding of their current fleet performance. Once rolled out nationally, the FleetWise tool developed under the National Strategy on Energy Efficiency should help with providing this information for commercial fleet managers interested in making voluntary efficiency improvements. Having a sufficiently detailed view of current fleet performance is also a necessary first step were improvements in commercial fleet efficiency to be considered as offsets under a possible energy savings initiative (see chapter 4).

Australia is one of the few developed countries without mandatory CO_2 emissions or fuel economy standards for light or passenger vehicles.

While strictly speaking an energy consumption rather than an efficiency issue, the treatment of corporate vehicles under fringe benefits tax is another barrier to improved transport energy outcomes. The inverse relationship between kilometres driven and the statutory formula for valuing car fringe benefits tax creates a perverse incentive for people to consume carbon-intensive non-renewable resources in order to pay less tax.[22]

The existence of discrepancies between the prices of different fuels caused by different rates of excise can also represent a barrier to improving the energy efficiency of our road transport. While fuel excise is levied according to energy content, some fuels are subject to concessional rates of excise. If transport fuels were subject to a broad-based carbon price, shifting to a regime in which excise on each transport fuel was in proportion to its energy content would ensure that fuel taxes provided the right overall signals about energy and emissions to consumers.[23]

These barriers to improved light vehicle energy efficiency are generally not unique to Australia. However, international comparisons suggest that other developed countries have taken stronger action to improve light vehicle efficiency and that these measures have contributed to their higher efficiency. Many countries provide financial incentives for lower-emissions vehicles through annual or time-of-purchase taxes differentiated according to environmental performance.[24]

More importantly, Australia is one of the few developed countries without mandatory CO_2 emissions or fuel economy standards for light or passenger vehicles.[25] (While the level differs between fuel types, a more fuel-efficient vehicle will have lower CO_2 emissions per kilometre.)[26] The Federal Chamber of Automotive Industries set a voluntary CO_2 emissions standard for light vehicles for 2010.[27] While this was attained two years early,[28] it has not been replaced. As a result, vehicles are not included in the successful Australian approach to minimum energy performance standards.

Current measures such as fuel consumption labels on new light vehicles and a forthcoming code for disclosing fuel consumption of vehicles in advertising will help improve the information available to consumers seeking an energy-efficient vehicle. However, in the case of almost every other major energy-consuming consumer durable in Australia, labelling is complemented by minimum energy performance requirements because cost–benefit analysis has demonstrated that well-designed minimum standards deliver net benefits.[29]

Analysis suggests that the same would be true for vehicles. For example, ClimateWorks estimates that efficiency improvements implemented through mandatory standards would provide net private and social financial benefits while reducing greenhouse gas emissions.[30] If a Regulation Impact Statement also

demonstrated net benefits, the introduction of mandatory standards would deliver net financial savings to households and businesses from lower vehicle operating costs and lower transport emissions for Australia.

The Task Group therefore proposes a strong approach to improving the fuel efficiency of our cars, including considering a mandatory light vehicle CO_2 emissions standard (currently the subject of a Commonwealth Regulation Impact Statement process) and supporting the Global Fuel Economy Initiative's '50 by 50' campaign, a worldwide project to improve car fuel efficiency.[31] It will also be important to consider the Commonwealth vehicle fleet and domestic automotive policy in the light of Australia's energy efficiency goals (see Box 9.1). The Government could also consider implementing the recommendation in the review of Australia's future tax system on removing the incentive to drive in our current fringe benefits tax arrangements.[32]

Current measures and barriers to further improvements in freight energy efficiency

For heavy vehicle fleet operators, current measures under the National Strategy on Energy Efficiency (once they are rolled out nationally) should provide a foundation for improving energy efficiency by helping to benchmark fleet emissions and providing information about opportunities to improve emissions and efficiency, including through driver behaviour or 'eco-driving'.[33] The largest heavy vehicle fleet operators also participate in the Energy Efficiency Opportunities program.

For road freight operators, a major barrier to further improvements in energy efficiency is the sizeable uncertainty about the energy and financial savings from capital-intensive energy efficiency investments.[34] The uncertainty surrounding the emissions and energy efficiency payoffs of capital investments in heavy vehicle fleets can be extremely large;[35] those familiar with the industry note that, without trialling a new technology under suitable conditions, it can be impossible to know whether the investment will even represent a net benefit. Given these uncertainties, some support for the provision of high-quality, Australia-specific information about the costs and benefits of energy efficiency improvements in road freight could help to improve road freight efficiency.

The Task Group suggests that a priority area for future Commonwealth consideration should be how to reduce the considerable uncertainty around the costs and benefits of energy efficiency improvements in road freight. This could include facilitating trials to evaluate low-emissions, energy-efficient technologies for heavy vehicles.

Box 9.1 The Green Car Innovation Fund and the Green Car Challenge — closer alignment to support the Australian vehicle industry

Achieving a tighter alignment between funding allocated under the Green Car Innovation Fund[36] and the Australian Government's commitment to purchasing Australian-made 'green' vehicles (the Green Car Challenge) is important for supporting a competitive Australian automotive industry.

With fuel efficiency standards set to become increasingly stringent across the world (see Figure 9.1), our export markets for vehicles could dwindle without faster improvements in vehicle efficiency.

Canada, the United Kingdom and the United States all have environmental targets of various kinds for their government fleets.[37] An overall CO_2 emissions target for the Commonwealth fleet would demonstrate government leadership in energy efficiency and help to drive efficiencies in the Commonwealth fleet as a whole. However, without specific attention to requirements for Australian-

made vehicles in the Commonwealth fleet, the industry may not benefit from the consistency of policy necessary for its continued strength.

In 2008, government buyers bought vehicles that were less efficient and more emissions intensive on average than those bought by Australian households or businesses.[38] Under the Australian Government's Green Car Challenge, by 2020, 50 per cent of the Commonwealth passenger vehicle fleet will be 'Australian-made, value for money, environmentally friendly cars'.[39] A definition of 'environmentally friendly' that set out an ambitious but achievable path for progressively lower CO_2 emissions per kilometre travelled would not only deliver efficiency gains for the Commonwealth but also support Australian vehicle manufacturers in meeting future market challenges. Requiring vehicles receiving funding under the Green Car Innovation Fund to be eligible for purchase under an ambitiously defined Green Car Challenge would ensure consistency between these two important aspects of Commonwealth policy.

Encouraging those states and territories without environmental targets for their government fleets to commit to the Commonwealth target if one was implemented could provide further demand for efficient vehicles.

The Task Group suggests the Commonwealth consider setting an emissions target for the Commonwealth vehicle fleet; encouraging states and territories without targets to join a Commonwealth target if one was implemented; and consider setting an ambitious but achievable definition of an environmentally friendly Australian-made car, and linking this definition to the provision of funding under the Green Car Innovation Fund.[40]

9.3 Putting Australia on an energy-efficient transport trajectory: setting the scene for the future

While bodies such as the International Energy Agency emphasise the importance of cost-effective energy efficiency improvements in vehicles for improving transport energy efficiency in the short and medium term, they also stress the importance of acting now to provide the infrastructure and investment necessary to give people the choice of taking more energy efficiency modes of transport. As the IEA notes:[41]

> To put transport on a sustainable pathway [within 40 years], current trends must be changed substantially within the next five to ten years. Strong policies are needed very soon to begin to shift long-term trajectories and to meet interim targets … Strong measures are also needed in terms of investments in infrastructure and incentives that can influence how people choose to travel and enable much greater use of efficient modes.
>
> IEA

To put transport on a sustainable pathway [within 40 years], current trends must be changed substantially within the next five to ten years.

To date, Australian energy efficiency strategies have generally not dealt with the energy efficiency improvements possible from providing additional public transport infrastructure or encouraging increased use of existing energy-efficient modes of travel. Given their importance in improving the energy efficiency of transport over the longer term, the Task Group proposes that energy efficiency strategies consider these issues explicitly in future. In a similar vein, while previous strategies have not explicitly considered electric vehicles, they are now becoming available in small numbers and raise some different issues to those associated with traditional passenger vehicles. The Task Group has therefore considered them separately.

Transport infrastructure and urban mobility

Effective, reliable and frequent public transport can offer an attractive energy-efficient alternative to the private car.[42] However, Australians can only choose to take more energy-efficient modes of transport if they are available. While there are some successes, current processes for choosing which transport infrastructure to build result in many segments of urban Australia lacking genuine options for choice between different modes of transport.

This is, in part, because Australian governments approving the construction of long-lived, energy- and emissions-intensive transport infrastructure generally have not given sufficient consideration to the energy and emissions associated with the use of that infrastructure. This situation will continue even if transport fuels are subject to a future carbon price. The result is a significant risk of locking in high-energy, high-emissions transport networks for decades to come, with associated health, productivity and amenity costs for Australians, particularly those living in our major cities.[43] It will be crucial to get the strategic frameworks for transport policy right early if Australia is to move on to a more energy-efficient transport trajectory. The same is true if Australian cities are to address the rising economic costs of avoidable congestion, which the Bureau of Infrastructure, Transport and Regional Economics estimates will reach $20.4 billion per year by 2020.[44]

Existing measures for infrastructure and urban mobility

The vast majority of transport infrastructure and urban and land-use planning decisions are state rather than federal matters. While the National Strategy on Energy Efficiency did not contain any transport or land-use planning measures, all levels of government share a commitment to improved strategic transport and land use planning.[45] The former Prime Minister outlined the Commonwealth's responsibility to provide national leadership in the development of strategic planning frameworks for Australia's largest cities.[46]

The Council of Australian Governments has endorsed a national objective and criteria for capital city strategic planning systems, with state plans required to be consistent with these criteria by January 2012 in order to be eligible for federal infrastructure funding.[47]

Assessing the costs and benefits of proposed transport project options ensures we select the options most beneficial to Australians. Australia has guidance that provides a basis for undertaking assessments of transport infrastructure proposals. The second edition of the *National Guidelines for Transport System Management in Australia*[48] was endorsed by all Australian jurisdictions in 2006 after being developed collaboratively by all levels of government. Work has commenced to update and refresh the guidelines; the values for some parameters, such as the price of carbon emissions, may require updating to reflect recent Australian Government research.[49]

A positive development in this area is Infrastructure Australia's identification of reducing greenhouse gas emissions as one of its seven strategic priorities when assessing infrastructure proposals.

As the transport system management guidelines are comprehensive, Infrastructure Australia should continue to require quite rigorous adherence with the updated version when assessing future proposals for funding. Ensuring adherence with the guidelines and using up-to-date values for parameters, especially those with a material effect on cost–benefit ratios, would ensure that differences in the estimated net benefits of projects submitted to Infrastructure Australia reflect real differences in expected project outcomes, including the different social costs of their associated energy and emissions trajectories.[50]

The Task Group proposes the Commonwealth examine how to more explicitly target energy efficiency outcomes when funding transport infrastructure and accelerate Australia's move toward best practice project appraisal, including increased transparency. The Task Group also suggests, consistent with the review of Australia's future tax system,[51] encouraging state and territory governments to consider the merits of extending variable congestion pricing to heavily congested parts of the road network. In making this suggestion, the Task Group acknowledges that the acceptability of congestion pricing will depend in part on the quality and availability of alternatives to private motor vehicle transport, suggesting that state and territory governments should consider how best to improve public transport infrastructure concurrent with any consideration of congestion pricing.

Providing public transport infrastructure is only the first step in helping urban Australians to make energy-efficient travel choices. Once the infrastructure is built, the quality of services (such as their frequency, reliability and safety) has to be high enough to provide a real alternative to car travel, and people have to understand their alternative options. There is some evidence that, while people are willing to use public transport and 'active' modes of travel such as walking and cycling, they would like help, such as through information, to turn this willingness into action.[52] To provide this information, several states run 'TravelSmart' programs.[53] Where public transport services of reasonable quality exist, these programs have shown that well-targeted information and marketing can expand demand for public transport[54] and can be cost-effective ways of realising improvements in transport energy use and emissions.[55]

The Task Group suggests, as a priority area for future investment, the Commonwealth support programs to encourage demand for public and active transport, based on the successful TravelSmart model that helps households and businesses with options for making more sustainable transport choices.

Electric vehicles

Electric vehicles and plug-in hybrid electric vehicles are vehicles that run completely or partially on mains-supplied electricity.[56] The relative energy efficiency and the relative environmental performance of vehicles powered by mains electricity depend on the efficiency and source of the generated electricity, respectively. Electric vehicles can already be efficient.[57] However, because of Australia's carbon-intensive electricity, an electric vehicle driven in Australia would be associated, on average, with about 30 per cent more emissions per kilometre than a similarly sized petrol car.[58] Over time, the relative emissions performance of electric vehicles will improve in line with the projected decarbonisation of the Australian electricity sector. For example, in 2020, with the emissions intensity of generation projected under Australia's unconditional 5 per cent emissions reduction target, electric vehicles in Australia would emit around 10 per cent fewer greenhouse gases than new passenger vehicles.[59] Electric vehicles therefore fall within the scope of the Task Group's work as one of a number of ways of improving vehicle energy efficiency.

The IEA and several countries have prepared technology roadmaps for electric vehicles.[60] Some countries also have specific policies to drive demand for these vehicles.[61]

In Australia, there is a small but growing amount of activity on policy in this area. Recently, state, territory and federal transport officials formed an electric vehicles network to exchange information on policy development. At the national level, the Smart Grid, Smart City initiative is expected to generate information about the effects of electric vehicles on the National Electricity Market.[62] A number of states and local governments are developing policies or programs on electric vehicles. These include an electric vehicle trial in Victoria,[63] a range of measures in New South Wales,[64] and Queensland's electric vehicle roadmap.[65]

Any electric vehicle sold in Australia is required to meet the Australian Design Rules — national standards covering a range of vehicle issues including safety, anti-theft performance, braking, and so on. But electric vehicles introduce specific new issues to do with the design of vehicle recharging infrastructure. The Task Group considers that electric vehicles are likely to be a part of the future Australian vehicle fleet. Smooth and timely resolution of issues such as common charging infrastructure and network interoperability — through the development of nationally and internationally consistent standards — would ensure that Australian households and businesses are able to take advantage of electric mobility over the coming years.

The Task Group proposes preparing for the possible electrification of passenger vehicles by developing the necessary standards now and, where states and territories continue to apply vehicle stamp duty and registration charges, seeking their support for charges that provide a technology-neutral financial incentive for lower emissions vehicles. A shift to systems based on encouraging the desired environmental outcomes (lower carbon and other air pollutant emissions) would be a better way of achieving the goal — implicit in many current state schemes — of offering discounts for some vehicle technologies (such as electric vehicles), as these technology-based discounts discriminate against low-emissions petrol and diesel vehicles. In the future, there may be a case for Australia preparing a policy roadmap on electric vehicles.

9.4 Expected benefits and costs

The discussion here suggests there is ample room for additional policies building on the National Strategy on Energy Efficiency to drive further cost-effective energy efficiency improvements in transport. If implemented, this approach would be expected to deliver lower-cost mobility for households and businesses, reduced emissions, improved energy security and increased transport choice in our urban areas over the longer term. The suggested approach — based on enhancing the information that supports decisions about vehicle and transport choices, considering ways in which pricing can improve transport energy efficiency, and minimum energy performance standards where these provide net benefits — is complementary to a broad-based carbon price. The costs and benefits of mandatory CO_2 emissions standards for light vehicles will be assessed in the forthcoming Regulation Impact Statement (see section 9.2).

9.5 Detailed proposals

The Task Group suggests that the Government:

Light vehicles

- Consider whether Australia should support the Global Fuel Economy Initiative's '50 by 50' campaign,[66] a global project to make cars 50 per cent more fuel efficient than 2005 levels by 2050.
  - The 50 by 50 Global Fuel Economy Initiative is a collaboration between the International Energy Agency, the United Nations Environment Program, the International Transport Forum and the Fédération Internationale de l'Automobile (FIA) Foundation. It aims to unite governments, consumers, and vehicle manufacturers to realise the significant improvements in fuel consumption that are technically possible but unlikely to be achieved without concerted policy action.

- Australia's formal support would send a strong signal about our commitment to vehicle fuel efficiency and provide a unifying goal for the proposed strong approach to improving vehicle fuel efficiency.

- Consider introducing mandatory CO_2 emissions standards for light vehicles.
  - Including investigating standards for non-engine components (such as tyres, air-conditioning systems and lighting) which affect vehicle fuel efficiency but which are not included in fuel efficiency test procedures[67]
  - If the Government decided to implement mandatory CO_2 emissions standards, the *Motor Vehicle Standards Act 1989* should provide the appropriate primary legislative authority.
- Consider setting an emissions target for the Commonwealth vehicle fleet, encouraging states and territories without targets to join a Commonwealth target if one was implemented, consider setting an ambitious but achievable definition of an environmentally friendly Australian-made car and linking this definition to the provision of funding under the Green Car Innovation Fund.
  - If Australia were to adopt mandatory light vehicle CO_2 emissions standards any Commonwealth fleet emissions target should be automatically reviewed to ensure that it remains consistent with the principle of government leadership in sustainability.
  - Under the Green Car Innovation Fund, automotive components and technologies are eligible for assistance in addition to entire vehicles, and vehicles incorporating technologies which have received assistance do not necessarily have to be produced or operated in Australia. The suggestion to consider requiring vehicles receiving funding under the Green Car Innovation Fund to be eligible for purchase under an ambitiously defined Green Car Challenge should only apply to entire vehicles intended to be sold in Australia.
- Consider implementing recommendation 9b of the review of Australia's future tax system on reforming the treatment of vehicles under fringe benefits tax.[68] The recommendation suggests replacing the current formula, which provides an incentive to drive, with a single tax rate of 20 per cent independent of kilometres driven.
- Investigate enhancements to existing vehicle labelling, additional promotion of the existing Green Vehicle Guide and the feasibility and desirability of expanding some form of labelling to second-hand cars sold through dealerships. These could be considered as part of building an energy efficiency culture (see chapter 7).
  - As electric vehicles become more readily available there may also be demand for information about the full lifecycle emissions and energy use of passenger vehicles.[69]

Freight

- Consider facilitating trials to evaluate low-emissions, energy-efficient technologies for commercial vehicles. If pursued such an approach could expand on the successful elements of the later stage of the Alternative Fuels Conversion Program, in which the Commonwealth partnered with the private sector in financing and facilitating technology trials and innovations for heavy vehicles. The process could involve partnering with fleet operators to select, evaluate and report publicly on trial technologies such as hybrid systems, improved aerodynamics, reduced rolling resistance and alternative fuels.
- Continue to monitor the development and implementation of international heavy vehicle standards with a view to their introduction when determination of emissions performance is feasible.

- The Australian Trucking Association notes that the development of a useful fuel efficiency rating system in the trucking industry is difficult because the fuel efficiency of a truck varies significantly depending on how the truck is configured, the application of non-engine technology options, the specification of freight and the terrain and conditions in which the fleet operates.[70] A first step towards assessing the performance of heavy vehicles is to measure the fuel consumption of selected vehicles across different duty cycles; this work is being undertaken by the NSW Government, to provide benchmarks for measuring fuel and emissions savings opportunities outlined in the National Strategy on Energy Efficiency.

Transport infrastructure and urban mobility

- Consider explicitly linking Commonwealth transport infrastructure funding to energy efficiency outcomes.
- Consider requiring Infrastructure Australia to assess all proposals for funding of transport projects, that is, across funding programs, not just through the Building Australia Fund.
- Move towards world best practice in transport and infrastructure appraisal processes and techniques, including:
  - Infrastructure Australia requiring that submitted appraisals use consistent, up-to-date estimates of variables including the cost of carbon emissions and ensuring appraisals submitted for funding adhere to the updated National Guidelines for Transport System Management in Australia as these become available
  - increased transparency in Infrastructure Australia assessment procedures including through making cost–benefit analyses for transport infrastructure projects publicly available.
- Encourage states and territories to implement recommendation 61 from the review of Australia's future tax system on congestion pricing (to analyse the potential benefits and costs of introducing variable congestion pricing on existing toll roads and consider extending it to heavily congested parts of the road network).[71] In making this suggestion, the Task Group acknowledges that the acceptability of congestion pricing will depend in part on the quality and availability of alternatives to private motor vehicle transport, suggesting that state and territory governments should consider how best to improve public transport infrastructure concurrent with any consideration of congestion pricing.
- Consider a 'Smart City' transport initiative as a priority investment area for public and active transport. Such an investment could provide support for capital or large regional cities to reduce private car and light commercial travel through an integrated approach based on the successful TravelSmart model. Building on lessons from Commonwealth funding for previous TravelSmart projects, such investment could focus on locations where good public or active transport choices already exist or where significant scope exists for improving choices in the short term.

Electric vehicles

- Consider support for Standards Australia to undertake a costed work program for standards on electric vehicles. This work would give priority to the immediate development of Australian standards for the three most pressing areas identified by a 2009 study.[72] The Standards Working Group of the Smart Grid, Smart City initiative will provide and disseminate relevant data from that trial.
  - The effects of electric vehicles on the National Electricity Market should also be considered and electric vehicle trials planned for the coming years are expected to generate information about these effects. As part of these trials, the Regulatory Working Group of the Smart Grid, Smart City initiative should consider links to the National Electricity Market frameworks, particularly in metering and billing arrangements for mobile charging.

- Consider making a clear announcement that, conditional on the decarbonisation of the Australian electricity supply proceeding as forecast or the availability of renewable energy to charge vehicles, Australia sees electric vehicles as a potential part of our future vehicle mix because of their potential energy efficiency and low emissions. Such an announcement could help solve a current barrier to gathering more information about the performance of electric vehicles and their interaction with smart grids in real-world Australian conditions: namely, that the stock of electric vehicles is currently quite small globally and manufacturers choose where to allocate available vehicles based in part on a particular country's policy environment.
- Where they retain these measures, encourage states and territories to consider revising both stamp duty and registration for new light vehicles to establish differential charges linked to environmental performance. A shift to systems based on encouraging the desired environmental outcomes (lower carbon and other air-pollutant emissions) would represent a better way of achieving the goal implicit in many current state schemes of offering discounts for some vehicle technologies (for example, electric vehicles) as these technology-based discounts discriminate against low-emissions petrol and diesel vehicles.

Notes

1 S Sandu & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009, p. 28.

2 Task Group calculation from Australian Bureau of Statistics (ABS), *Australian historical population statistics*, ABS cat. no. 105.0.65.001, and the National Greenhouse Gas Inventory.

3 Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Greenhouse gas emissions from Australian transport: projections to 2020*, BITRE Working Paper no.73, 2009, p. 117 and p. 5.

4 BITRE calculation from ABS, *Motor vehicle census*, cat. no. 9309.0.

5 IEA, *Transport, energy and CO_2: Moving toward sustainability,* OECD, Paris, 2009, p. 29.

6 BITRE, p. 117.

7 Sandu & Petchey, Figure 22, p. 30.

8 BITRE, p. 117.

9 Sandu & Petchey, Figure 27, p. 34.

10 IEA, *IEA scoreboard 2009,* OECD, Paris, 2009, p. 95.

11 Data from Ward's Automotive show that, in 2008, the top 10 markets for new passenger vehicles represented around 90 per cent of global new car sales. At least seven of the top 10 markets had better new passenger car fuel efficiency than Australia.

12 IEA, *Transport, energy and CO_2;* Global Fuel Economy Initiative, *50 by 50 global fuel economy initiative: Making cars 50% more fuel efficient by 2050 worldwide*, 2009; ClimateWorks Australia, *A low carbon growth plan for Australia*, 2010; Smith School of Enterprise and Environment, *Future of mobility roadmap ways to reduce emissions while keeping mobile*, University of Oxford, 2010.

13 IEA, *Transport, energy and CO_2*, p. 184.

14 IEA, *IEA scoreboard 2009*, pp. 92–3.

15 BITRE calculation using data underlying BITRE 2009.

16 See ClimateWorks, p. 74, for a discussion of barriers to improving road transport fuel efficiency.

17 Light vehicles are four-wheeled road vehicles with a gross vehicle mass of 3.5 tonnes or less. There are three categories of light vehicles: passenger vehicles, sports utility vehicles and light commercial vehicles.

18 IEA, *Transport, energy and CO_2*; Global Fuel Economy Initiative; ClimateWorks.

19 See, for example, K Kurani & T Turrentine, *Automobile buyer decisions about fuel economy and fuel efficiency: Final report to United States Department of Energy and Energy Foundation*, 2004.

20 Australian Transport Council & Environment Protection and Heritage Council, *Potential measures to encourage the uptake of more fuel efficient, low carbon emission vehicles: Public discussion paper*, September 2008, p. 10.

21 Data on the average number of owners a vehicle has in its lifetime or the average duration of each period of ownership are not readily publicly available. However, it is widely agreed that fleet vehicles are owned for two to three years. The average total time a vehicle spends in the Australian vehicle stock used here (20 years) is a BITRE calculation from ABS, *Motor vehicle census*, cat. no. 9309.0.

22 See Commonwealth of Australia, *Review of Australia's automotive industry final report,* 22 July 2008, pp. 68–9, for a discussion of perverse incentives from the current arrangements for fringe benefits tax on cars.

23 *Australia's future tax system: Report to the Treasurer: Part 2: Detailed analysis, vol. 2,* December 2009, pp. 388–9, 398.

24 IEA, *Transport, energy and CO_2,* pp. 178–80, 191.

25 See IEA, *Transport, energy and CO_2*, 2009, p. 175.

26 Table 4, p. 5 of National Transport Commission, *Carbon emissions from new Australian vehicles,* November 2009, shows fuel efficiency and corresponding CO_2 emissions for petrol and diesel vehicles.

27 Federal Chamber of Automotive Industries, www.fcai.com.au/library/NACE%20Fact%20Sheet%20February%202010.pdf, accessed 4 June 2010.

28 Federal Chamber of Automotive Industries.

29 Department of the Environment, Heritage, Water and the Arts, *Equipment energy efficiency program: Achievements 2008–09,* report 2009/14, 2009. Australia's longstanding program of energy performance standards and labelling is projected to reduce greenhouse gas emissions in Australia by 19.5 Mt CO_2-e per year by 2020, with a negative cost of $56 for every tonne saved.

30 ClimateWorks, pp. 73–5.

31 The 50 by 50 campaign is discussed further in section 9.5.

32 *Australia's future tax system Final report: Overview,* 2010, p. 82.

33 In its July 2008 discussion paper *Freight transport in a carbon constrained economy*, the National Transport Commission described greenhouse emissions from freight transport as a 'policy blind spot' (p. 10); however, at least in the case of road freight, heavy vehicle measures under the National Strategy on Energy Efficiency have begun to fill some of the roles for government identified by the commission.

34 Freight pricing structures can also affect freight energy efficiency by influencing the choice between road and rail freight on routes where a choice exists. If successful, current road pricing reforms aimed at improving the economic efficiency of road freight have the potential to create a competitive neutrality issue with rail freight on routes where the two modes compete. If current work on mass–distance–location pricing for heavy vehicles results in road freight paying its short-run marginal cost, there may be a case for raising road freight charges to create a level playing field with rail on corridors where the two modes compete. See *Australia's future tax system*, pp. 390–1, for further details.

35 National Transport Commission, *Freight transport in a carbon constrained economy*, July 2008, p. 19.

36 See www.ausindustry.gov.au/Manufacturing/GreenCarInnovationFund/Pages/GreenCarInnovationFund(GCIF).aspx, accessed 24 June 2010.

37 See www.dft.gov.uk/pgr/scienceresearch/technology/transportewp, www.gsa.gov/Portal/gsa/ep/contentView.do?programId=17053&channelId=-25142&ooid=17005&contentId=29134&pageTypeId=8199&contentType=GSA_BASIC&programPage=%2Fep%2Fprogram%2FgsaBasic.jsp&P=OMS and www.tbs-sct.gc.ca/reports-rapports/aafa-alcr/2009/aafa-alcr03-eng.asp.

38 Figures on CO_2 emissions per kilometre by purchaser type come from National Transport Commission, *Carbon emissions from new Australian vehicles,* November 2009.

39 For a statement of the Green Car Challenge, see www.finance.gov.au/vehicle-leasing-and-fleet-management/docs/200907_Launch_of_the_Toyota_HybridCamry.pdf, accessed 27 June 2010.

40 Under the Green Car Innovation Fund, automotive components and technologies are eligible for assistance in addition to entire vehicles, and vehicles incorporating technologies which have received assistance do not necessarily have to be produced or operated in Australia. The suggestion to consider requiring vehicles receiving funding under the Green Car Innovation Fund to be eligible for purchase under an ambitiously defined Green Car Challenge should only apply to entire vehicles intended to be sold in Australia.

41 IEA, *Transport, energy and CO_2*, p. 41.

42 See the comparison between the energy intensity of different modes of passenger transport in Sandu & Petchey, p. 34.

43 Lack of alternatives to car travel contributes to avoidable urban congestion, which also affects those in rural and regional Australia by increasing travel times and delivery costs for road freight.

44 BITRE, *Estimating urban traffic and congestion costs for Australian cities*, BITRE Working Paper no. 71, 2007.

45 See, for example, the COAG Communique of 7 December 2009, p. 8, www.coag.gov.au/coag_meeting_outcomes/2009-12-07/index.cfm#cap_city_strat, accessed 4 June 2010.

46 'Building a big Australia: Future planning needs of our major cities', Prime Minister's address to the Business Council of Australia, 27 October 2009.

47 COAG, communiqué, 7 December 2009.

48 Available online at www.atcouncil.gov.au/documents/NGTSM.aspx, accessed 27 June 2010.

49 The current estimate for the carbon price in the guidelines (vol. 3, pp. 74 and 101) comes from p. 393 of C Pratt, 'Estimation and valuation of environmental and social externalities for the transport sector', paper presented at the Australasian Transport Research Forum, Canberra, 2002, and is around $40 per tonne in 2002 prices. An appropriate replacement could be the estimates prepared by the Australian Treasury for the Australian Government in *Australia's low pollution future: The economics of climate change mitigation*. Chart 6.3 on p. 140 shows that the estimated carbon price rises in real terms over time, ranging from around $80 to $130 in 2040 (the end of the suggested 30-year horizon for infrastructure appraisal) in 2005 real dollars, depending on the scenario. More broadly, it may be desirable to develop mechanisms for updating key parameters in between updates of the guidelines as a whole: that way the guidelines could provide a framework for the principles and methods for determining parameters, but up-to-date values consistent with these principles could be included (after appropriate review) as they come to hand. This would seem be consistent with the spirit of the section on 'parameter values' on p. 14 of volume 3 of the guidelines.

50 Given the scale of the various costs and benefits in many infrastructure projects, the social cost of carbon emissions does not generally have a material effect on a project's cost–benefit ratio.

51 *Australia's future tax system*, p. 92.

52 See, for example, Western Australian Government, *TravelSmart 2010: A 10 year plan*, 1999, p. 9. In a survey of an inner-city Perth suburb, 82 per cent of the residents surveyed were willing to use alternative travel modes, while 55 per cent said they required help, such as information, to access them.

53 For information about TravelSmart, see, for example, the Western Australian or Victorian government's TravelSmart website: www.transport.wa.gov.au/travelsmart/14890.asp and www.transport.vic.gov.au/doi/internet/ict.nsf/headingpagesdisplay/travelsmart, accessed 15 June 2010.

54 See, for example, *Evaluations of TravelSmart programs in ACT, South Australia, Queensland, Victoria and Western Australia 2001–2005: Report to Department of Environment and Heritage and State TravelSmart programme managers, 2005*, in particular the evaluations of ongoing changes in travel behaviour from Perth TravelSmart programs on pp. 16–17.

55 Initial estimates for the Western Australian Government suggest that investment in TravelSmart projects have a positive financial effect (through increased public transport revenue and other benefits) even before accounting for reductions in greenhouse gas emissions. See, for example, *Preliminary evaluation of the financial impacts and outcomes of the TravelSmart individualised marketing program: Update for WA Department for Planning and Infrastructure*, November 2002.

56 Unless making a specific reference to plug-in hybrid electric vehicles, this report uses 'electric vehicles' to refer to both electric vehicles and plug-in hybrid electric vehicles.

57 Because completely electric vehicles use their fuel more efficiently than conventional vehicles, they are capable of producing lower total emissions than conventional vehicles even with emissions-intensive electricity. For example, the Smith School of Enterprise and Environment (p. 15) shows that, if the efficiency of electricity generation and supply to end users is around 33 per cent and electricity is generated almost entirely from US coal, the Tesla Roadster (an electric vehicle) would have emissions of 198 g per km, still lower than the 2009 average for new Australian light vehicles of 218 g per km (see Federal Chamber of Automotive Industries).

58 R Garnaut, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008, p. 519.

59 Task Group calculation using data from *Australia's low pollution future*; ClimateWorks; and BITRE 2009.

60 See IEA, *Technology roadmap: Electric and plug-in hybrid electric vehicles*, p. 38, and the European Union's strategy at europa.eu/rapid/pressReleasesAction.do?reference=MEMO/10/153&format=HTML&aged=0&language=EN&guiLanguage=fr, accessed 15 June 2010.

61 See, for example, the United Kingdom's measures at www.dft.gov.uk/pgr/sustainable/olev, accessed 4 June 2010.

62 *Smart Grid, Smart City*, www.environment.gov.au/smartgrid/index.html, accessed 4 June 2010.

63 Electric Vehicle Trial, www.transport.vic.gov.au/web23/Home.nsf/AllDocs/246D50F44EB2272DCA2576A50015AE1E?OpenDocument, accessed 4 June 2010.

64 Plug-in vehicles, www.environment.nsw.gov.au/cleancars/index.htm, accessed 4 June 2010

65 An electric vehicle roadmap for Queensland, www.climatechange.qld.gov.au/whatsbeingdone/queensland/electricvehicleroadmap.html, accessed 22 June 2010.

66 For details of the campaign, see www.50by50campaign.org/publications/Pages/PublicationsHome.aspx, accessed 15 June 2010.

67 See IEA, *Transport, energy and CO_2*, pp. 195–7.

68 *Australia's future tax system: Final report: Overview*, 2010, p. 82.

69 The average 'cradle-to-grave' emissions from electric vehicles are still lower than those of conventional vehicles (Smith School of Enterprise and Environment, p. 10).

70 Australian Trucking Association, *Submission in response to Vehicle Fuel Efficiency Discussion Paper*, 2008, p. 2.

71 *Australia's future tax system*, p. 92.

72 These are standards for the design of aftermarket electric vehicles (as small numbers of these are already being sold in Australia); design and operation of recharging systems; and standardisation of user and greenhouse gas information relating to electric vehicles sold in Australia. See J Lazar & M McKenzie, *Electric vehicle standards in Australia: A scoping study*, 2009, p. vi, for further details.

Buildings

Harnessing energy efficiency opportunities in the buildings sector will be important in achieving Australia's long-term energy efficiency and emissions reduction goals. Much has been done in recent years to reduce barriers to action, but further opportunities remain. An integrated vision is necessary to drive and direct change. If combined with an energy savings initiative, support for innovation, and measures to strengthen industry's capacity to change, the energy efficiency performance of the buildings sector could be transformed.

Approximately a fifth of Australia's energy is consumed within buildings. Estimates of the potential within the buildings sector suggest that as much as 30 Mt CO_2-e of annual abatement could be achieved in a cost-effective way by 2020.[1] But the sector is large and complex, with diverse stakeholders along the supply chain and multiple market barriers to energy efficiency. A suite of specific policy interventions may be necessary to help unlock the cost-effective energy efficiency potential of the sector.

The Task Group considers the following options as priorities for action in the buildings sector:

- developing a comprehensive long-term vision for the sector
- strengthening Australia's building energy assessor capacity.

These options, taken together, could help speed energy efficiency upgrades and reduce costs. They could facilitate an energy efficiency transformation across the built environment, driving improvements to the existing building stock while supporting innovation and strengthening industry's capacity to deliver robust and reliable energy efficiency outcomes.

Existing buildings consume approximately 20 per cent of energy used in Australia, and each new building will typically last for the next 30 to 80 years. So action to improve the energy performance of Australia's building stock is important to any long-term energy efficiency and emissions reduction goals.

Moving new buildings to a higher level of performance can avoid 'locking in' inefficient infrastructure. Finding ways to improve our existing buildings is necessary to enable a substantial change to occur in the short to medium term, as stock turnover (that is, the replacement of old with new) is only about 2 per cent per year.

It is often claimed that the buildings sector offers 'low-hanging fruit' in energy efficiency opportunities. However, many different barriers to energy efficiency hinder these opportunities from being realised.

This chapter details the challenge of improving the energy efficiency of the buildings sector, outlines what measures are already in place, and suggests points where additional government action could be best placed to facilitate energy efficiency improvements.

This chapter also summarises the many options put forward throughout this report that are relevant to the built environment. These include:

- establishing an energy savings initiative, which includes coverage of the buildings sector
- supporting innovation through energy-efficient hubs
- growing Australia's energy services sector and improving government and community buildings
- improving energy efficiency standards.

10.1 The buildings challenge

Constructing, renovating and operating buildings so they are more energy efficient can be a complex endeavour — involving product manufacturers, urban planners, financiers, architects, builders, tradespeople, energy service companies, building energy assessors and, ultimately, the people operating, working or living in the buildings concerned.

Barriers that may prevent the take-up of energy efficiency in buildings are encountered at various points by this complex mix of stakeholders. These barriers include:

- lack of accurate pricing — for example, poor reflection of savings from a delayed network infrastructure investment
- split incentives — where the developer, building owner, building manager, financier, and occupier bear different costs or have different interests, separating the incentives for energy efficiency investments
- lack of market understanding and recognition of the benefits of advanced buildings (including broader benefits such as health benefits, increased market value and higher tenancy rates)
- lack of information, knowledge and broad experience about what can be achieved and how
- skills gaps — which inhibit promotion, take-up, and the quality of the end product (particularly in emerging technologies and systems)

- planning, transaction costs and energy market barriers that inhibit distributed generation and the innovative partnerships which support them
- materiality issues — where energy costs often make up only a relatively small portion of total expenditure
- uncertainty — including about future increases in minimum energy efficiency performance standards or long-term goals
- capital constraints for smaller businesses and households.

A further issue is that a fundamental mismatch in societal and private time preferences can occur — in other words, there is an 'investment timing gap'.[2] Depending on the upgrade undertaken, a long time can pass between when the capital investment is made and when the benefits are realised. Despite the long lifespan of buildings, investors (and homeowners) typically look for energy efficiency paybacks over much shorter timeframes, often just a few years.

The introduction of a carbon price would help overcome some of these barriers but others would remain. An increasing price over time would continue to weaken barriers, but only a very high carbon price could eliminate barriers such as split incentives. Additional action is called for, some of which is complementary to a carbon price and would be maintained in the long term and some of which is short term and transitional, pending the emergence of a mature carbon price.

The diversity of stakeholders in the sector and the complex supply chains involved mean that any single intervention is unlikely to overcome all barriers to action and hence a range of policies may be required. To provide clarity to the sector, it is important that these stakeholders have a good understanding of both the range of these policies and the way in which they relate. The sector includes large national or multinational companies investing in property portfolios, through to single individuals buying or renting a home. The diversity of skills required adds to this complexity, from individual tradespeople through to large teams using sophisticated computer modelling to design new, iconic commercial buildings. To construct high-performing buildings, multiple stakeholders along the whole supply chain need to change the way they work together, by modifying their standard business practices.

Furthermore, buildings are not constructed in isolation. Together they form the suburbs and cities in which we live — making system-wide planning, design and infrastructure considerations important to large-scale, long-term change (see Box 10.1). The vast array of building types (due to the almost infinite range of technologies, design methodologies, operation and management approaches, and climatic variations), diverse business relationships and varied consumer expectations all make tapping into the most effective intervention points even more difficult.

Box 10.1 Planning for the long term — making infrastructure energy efficient

The way in which Australia's infrastructure is planned, constructed and operated can promote energy efficiency or it can 'lock in' poor performance for decades to come. It is important to ensure that the buildings, suburbs, towns, cities, and transport and energy networks we construct today help rather than hinder the transition to a lower-carbon future and facilitate a step change in our energy efficiency over the long term.

The barriers and challenges to constructing energy-efficient infrastructure include split incentives, information failures, and a complex supply chain. For example, the developers who design and construct new suburbs do not pay the heating or fuel bills of future residents. The maturing of a carbon price over time would help reduce these barriers.

To this end the Task Group has suggested several initiatives throughout this report that could support energy efficiency infrastructure investments over time. For example, chapter 9 discusses transport infrastructure and urban mobility issues in more detail, and chapter 11 proposes support for innovation in new and existing infrastructure through 'energy-efficient hubs'.

Several national initiatives in place or under consideration may also influence the energy efficiency of Australia's future infrastructure. These include:

- COAG's endorsement of a national objective and criteria for capital city strategic planning systems, with state plans required to be consistent with these criteria by January 2012 in order to be eligible for federal infrastructure funding[3]
- work by Infrastructure Australia on transforming our cities through a national urban policy and best practice strategic infrastructure planning[4]
- the recommendation by the review of the *Environment Protection and Biodiversity Conservation Act 1999* to 'consider cost-effective climate change mitigation opportunities as part of strategic assessments'.[5]

These initiatives already include consideration of climate change mitigation and adaptation issues. The Task Group believes that explicit consideration of energy efficiency outcomes as part of this work would be beneficial.

In addition to the complexity of the sector, its large size means governments need to carefully consider how best to catalyse change. Total buildings sector capital investment is estimated to be between $150 billion and $170 billion per year.[6] There are around 330 million square metres of floor area in Australia's non-residential buildings,[7] and approximately 150,000 new homes are constructed each year, from a base of about 8.5 million existing homes.[8]

There are many opportunities for businesses and homeowners to achieve greater energy efficiency, and reductions in greenhouse gas emissions, often at little cost or with cost savings over a reasonably short timeframe (see Box 10.2). However, to capture this potential it has been estimated that approximately $13 billion of capital investment would be required for the commercial sector alone.[9]

Box 10.2 Estimates of the buildings sector's potential

Two recent reports have estimated the potential emissions reduction opportunities from improved energy efficiency in buildings to be substantial.

- ClimateWorks has estimated that improving the energy efficiency of buildings and the appliances within them has the potential to lead to around 28 Mt CO_2-e of annual abatement in 2020 if a range of measures are fully implemented.[10]
- The Australian Sustainable Built Environment Council has estimated that energy efficiency measures could achieve more than 30 Mt CO_2-e of annual abatement in 2030.[11]

Although there are many barriers to the realisation of emissions reductions on this scale, the ClimateWorks report suggests that energy efficiency actions in the buildings sector can provide net financial benefits to society. (See also Box 1.2.)

To harvest a reasonable proportion of estimated energy efficiency potential in the sector, and achieve lasting change, actions will be required that have flow-on effects to as many stakeholders as possible. These might include:

- finding new ways to leverage private sector finance
- supporting innovation in technologies, processes and new business models
- developing industry capacity in identified areas of need
- working to develop a long-term plan for change that covers both new and existing residential and commercial buildings.[12]

In relation to developing industry capacity, focusing on strengthening the capabilities of those professions which either work across multiple points in the supply chain or which are key influencers may provide high initial leverage. Energy service companies and building energy assessors work at multiple levels along the supply chain, from design through to commissioning and regulatory compliance. They are therefore worthy of close attention in delivering energy efficiency outcomes.

10.2 Existing measures

Clearly efforts over the medium and long term to consolidate these programs could improve national coherence, enhance stakeholder understanding, and lead to better energy efficiency outcomes.

Many interventions to reduce barriers and complexity are in place or are being developed, but gaps remain.

The building measures in the National Strategy on Energy Efficiency include:

- increasing the stringency of the energy efficiency requirements for new commercial and residential buildings[13]
- mandatory energy efficiency and, potentially, greenhouse gas emissions disclosure requirements at the point of sale or lease for residential and commercial buildings
- development of a way forward on building energy ratings, assessments and standards
- development of a national policy on green lease schedules
- stocktakes of training and skills in the sector
- some strengthening of national capability in energy auditing and assessment.

The National Strategy also contains several measures relating to the appliances and equipment used in buildings — including new and accelerated minimum energy performance standards, and the establishment of national legislation on these standards and labelling (see chapter 14 for further discussion of standards).[14]

These COAG initiatives are operating in parallel with other interventions at different levels of government, aimed at addressing other barriers through innovation (see section 11.2). In total, there are around 50 individual measures aimed at improving sustainability in the built environment contained in the National Strategy on Energy Efficiency or delivered by the Australian Government. Separate state, territory and local government measures add to this figure.[15] Clearly efforts over the medium and long term to consolidate these programs could improve national coherence, enhance stakeholder understanding, and lead to better energy efficiency outcomes.

Despite this proliferation of measures, planned or in place, barriers to action remain and further opportunities to encourage energy efficiency in buildings exist:

- Improvements to standards aim to increase the minimum performance of buildings over time (raising the 'floor'); however measures that encourage leaders or spur innovation (lifting the 'ceiling') are limited.
- Mandatory disclosure of energy performance will help deal with some information failures — but credible, detailed and widely available information regarding the full costs, benefits and real experiences of upgrades is not widely available.
- The National Strategy's buildings framework measure (under development) is designed to provide a forward plan for new building standards and a framework for building energy assessment and software tools. However, stakeholders have called for a more comprehensive picture and a long-term strategy for new and existing buildings.[16]
- While there is an emerging pool of building energy assessors, more could be done to improve the capability and assure the quality of assessors (particularly in the residential sector), and to improve the decision support tools available to the industry.
- National rebate or grant programs for the sector have focused on providing incentives for actions in individual buildings, but there may be further opportunities for innovation and collaboration across city blocks or in new urban developments.

10.3 Options to support a step change

Given the remaining barriers to energy efficiency action and the opportunities outlined above, the Government may wish to consider the following areas as priorities for action:

- establishing an energy savings initiative, which includes coverage of the buildings sector (see chapter 4)
- supporting innovation in, and catalysing of, private sector finance for building upgrades
- growing Australia's energy services sector and improving energy efficiency in government and community buildings
- improving energy efficiency standards for appliances, equipment and buildings
- developing a comprehensive long-term vision for the sector
- strengthening Australia's building energy assessor profession.

An energy savings initiative

An energy savings initiative could be a major driver for energy efficiency action in existing residential and commercial buildings. An energy savings initiative would set a target for an overall amount of energy efficiency gain that must be made within a certain timeframe. It would set rules about what activity is eligible for meeting the target and where the obligation rests. Irrespective of the parties with obligations under such an initiative, the energy efficiency gains can occur in any sector covered by the initiative. Such an initiative has the potential to drive energy efficiency upgrades to homes and commercial buildings, and to increase demand for building energy efficiency services and products.

Supporting innovation and catalysing private sector finance

Additional support for innovative pilot projects that demonstrate new technologies, financial models and business partnerships could have a transformative impact on the built environment. The Task Group has identified three proposed approaches:

- industrial hubs that would demonstrate energy synergies (and energy efficiency/ distributed generation technologies) in regional network-constrained areas and manufacturing and mining activities
- net zero-emissions urban hubs that would showcase new high-technology and low-emissions residential buildings and precincts
- central business district hubs (CBD hubs) that would feature retrofits for highly energy efficient commercial buildings and district-scale energy solutions.

These approaches could assist businesses to test, improve and encourage efficient technologies and business models at the neighbourhood scale. If implemented through a consortium approach (such as that used for the Solar Cities program), these proposals could help demonstrate the potential of integrated precinct-scale solutions. For example, they could help test the value to energy networks of combining neighbourhood-scale energy efficiency building upgrades and distributed generation technologies (such as trigeneration).

These proposed approaches could also help:

- overcome remaining information gaps by collecting and disseminating credible information on the costs, benefits and real experiences of delivering energy-efficient buildings (both for upgrades and new leading-edge buildings) as an integral part of our towns and cities[17]
- accelerate increases in minimum building energy standards over time by demonstrating the potential in new building designs and increasing industry capacity
- support innovative financing approaches (such as 'property accessed clean energy finance'— or 'PACE finance' — models)
- improve tools to support decisions on building software
- identify and address remaining barriers to energy efficiency in the built environment.

Chapter 11 explores 'energy-efficient hubs' in more detail.

Improving government and community buildings

Improving Australian Government buildings and upgrading community facilities, such as hospitals and local government buildings, could further catalyse change in the built environment. The Task Group suggests that the following initiatives could be considered as priority areas for action (see chapter 13):

- further development of standard form contracts, education and training modules, professional accreditation services, and a performance auditing and monitoring regime for the energy services sector
- a revolving financing mechanism to support building energy efficiency improvements across community facilities (such as education, health and other community buildings)
- revising the current energy saving targets for Australian Government buildings and scoping possible financial mechanisms that could support necessary building retrofits.

A summary of actions and opportunities related to government leadership is provided at Appendix I.

Improved energy efficiency standards

Improving energy efficiency standards, ratings and labelling for appliances, equipment and buildings could provide further energy efficiency benefits to the built environment (see chapter 14). This process could go beyond simple minimum standards for new buildings, to possibly establishing a new high energy performance standards and ratings scheme. Such a program could both recognise industry leaders and help inform the purchasing decisions of consumers by making it easier to identify the most energy-efficient appliances, equipment and buildings.

Developing a comprehensive long-term vision for the sector

A 'pathway towards zero-emissions buildings' could be developed to better link measures in the sector under a clear and coherent strategy. Bringing the threads together in a way that makes sense for industry and the community is likely to increase certainty and enhance outcomes. A pathway would also complement a national energy efficiency target by providing sector-specific context.

> By establishing a series of connected targets for the building sector, the government would make a significant step in improving the understanding of the building industry and the community, and allow industry to work with government on the most practical and cost-effective means of achieving those targets, including establishing a timetable to transition towards a long term target.
>
> Housing Industry Association submission to the Task Group

'The ultimate indicative goal should be zero emission buildings (for both residential and commercial buildings).'

The policy goal for such a pathway could be to establish a vision and timeframe for delivery of new standards for net zero-emissions buildings, and to drive a transformation of our existing building stock. A comprehensive pathway would therefore cover both new and existing buildings, in both the residential and commercial sectors. It could also seek to better link actions across policy domains and across levels of government, such as improving synergies between energy efficiency in buildings and broader urban or infrastructure planning.

> The ultimate indicative goal should be zero emission buildings (for both residential and commercial buildings).
>
> Australian Sustainable Built Environment Council submission to the Task Group

Box 10.3 What is a zero-emissions building?

A net zero-emissions building is generally defined as a building that over the course of a year offsets as many greenhouse gas emissions as it creates (or generates enough renewable energy to power itself).

A zero-emissions building combines passive energy-efficient design, energy-efficient appliances and renewable power generation (sometimes not located on site but possibly as part of a nearby neighbourhood project).

To construct a zero-emissions building a range of industry skills are needed so that the building's 'system' works effectively. For example, the architect would need to understand passive design principles, builders and tradespeople would need to know how to build an air-tight shell, energy assessors may need to be consulted on design tradeoffs regarding energy efficiency design details, and a renewables company or energy service company might be involved in supplying green energy.

Close collaboration with industry, the community and the states and territories in developing a pathway for the future would be essential to help garner support for widespread action. A pathway could also flag regular review points to take into account new circumstances and to inform adjustments to policy settings.

Development of a pathway towards zero-emissions buildings should complement and build upon, rather than revisit, the outcomes of the buildings framework measure under the National Strategy on Energy Efficiency.[18]

The development of a pathway could include further analysis of the barriers to action and current measures in the sector. In doing so, it would be important to work towards minimising duplication and fragmentation where possible, and to further consider how to make progress on a comprehensive 'floor and ceiling' approach. New measures could be considered where they address remaining barriers or gaps. Development of a pathway could also strengthen links with minimum energy and greenhouse performance standards for appliances and equipment, as well as provide a mechanism to investigate possible future minimum standards for existing buildings.

Box 10.4 Green building tax incentives

A number of proposals put forward throughout this report aim to support upgrades to existing buildings and also provide incentives for innovation in the buildings sector — such as the proposed energy savings initiative (see chapter 4) and the energy-efficient hubs proposals (see chapter 11).

An alternative called for in some submissions to the Task Group was the use of tax depreciation arrangements (or 'green depreciation').[19] However, questions remain as to whether green depreciation is the most efficient and effective mechanism to encourage energy efficiency upgrades or innovations in the buildings sector.

Appendix M discusses possible use of the tax system to provide incentives for building energy efficiency in more detail.

'Construction of new, more energy efficient buildings and the retrofitting of existing buildings will require a more skilled workforce. '

Strengthening Australia's capacity to assess building energy use

If the buildings sector is to be transformed and its energy efficiency potential achieved, the capacity of the industry to deliver this change must be strengthened. Industry capacity to provide advice on energy efficiency must be robust and reliable, so that investment decisions by businesses and individuals can be made with confidence. The decision support tools (such as energy assessment software) on which the industry relies must be credible and well supported.

Several current initiatives are aimed at improving the energy efficiency skills base, including those in the National Strategy on Energy Efficiency (the National Energy Efficiency Skills Initiative) and also under the Green Skills Agreement (see chapter 15). However, these measures have not provided a comprehensive package of support for people working in the building energy assessor industry to ensure they are 'up to the task'.

> Construction of new, more energy efficient buildings and the retrofitting of existing buildings will require a more skilled workforce. Government assistance is needed to overcome structural skills shortages in the building industry and to train workers in the new green building techniques that will be required.
>
> Master Builders Association submission to the Task Group

> There is a significant need to build capacity in the energy efficiency sector and property sector.
>
> Energy Efficiency Council submission to the Task Group

To enable and fast-track building efficiency efforts, consideration could be given to strengthening the enabling mechanisms of:

- building energy assessor skills and capacity
- building energy assessment software tools
- evaluating building energy efficiency codes.

Improving the training and skills of building energy assessors and supporting governance mechanisms in the sector would result in better advice being provided to customers, quality assurance of assessors, and ultimately improved on-the-ground outcomes. For example, a consistent national approach to the accreditation and auditing of assessors could improve the quality of the profession and, eventually, buildings.

> The Property Council believes that all users of rating tools for regulatory purposes should be properly accredited and audited by professional bodies.[20]

Energy assessment software tools are increasingly important for the delivery of highly energy-efficient buildings. They are the main mechanism for assessing compliance with the building code (estimated to be used for around 70 per cent of new homes following recent code changes),[21] facilitating flexibility in meeting performance standards, and allowing the diverse climates around Australia to be taken into account. Ensuring that building energy assessment software tools are fit for purpose, are well maintained and keep up with industry product advances would improve their credibility and lower overall compliance costs to industry. Action to support this could include the development of new cutting-edge tools and assistance for the industry to be able to use these effectively.[22]

Part of ensuring quality is mining the lessons of the past. An evaluation of the effectiveness of the energy efficiency provisions of the Building Code of Australia and supporting systems could be undertaken as part of this proposal. This could inform future improvements of the building code and industry capacity-building measures. This assessment could also go some way to helping promote understanding of how individual industries and industry supply chains have adapted over time to the standards. Such an evaluation has been requested by industry on many occasions,[23] has been recommended by the Productivity Commission, and would provide an informed basis for future changes.

Additional related measures in other chapters

The above options are further supported by initiatives discussed in chapters 6, 7, 9 and 15.

Summary of possible outcomes

If the initiatives put forward throughout this report relating to the built environment were all implemented they could be expected to transform the way we construct, renovate and use our buildings.

The effect would be to:

- show the way to industry leaders and fast followers, while also providing the needed impetus for increasing future minimum energy performance requirements for buildings
- build industry and community support for change
- help fill critical information gaps
- build synergies between measures, including appliances and equipment measures
- increase the industry's capacity to deliver robust and reliable energy efficiency outcomes
- establish a sound basis for future policy.

However, even if only individual actions were selected by government for implementation, each would be expected to lead to improvements in the sector by targeting specific barriers or filling remaining policy gaps.

10.4 International precedents

Internationally, the potential for energy efficiency and emissions reductions from the buildings sector is well recognised. For example, a survey of 80 international studies found that there is a global potential to cost-effectively reduce around 29 per cent of the projected baseline emissions in the residential and commercial sectors by 2020.[24]

In addition, many countries have begun to adopt long-term strategies to deliver highly energy-efficient buildings — including setting national goals and pathways towards zero-energy or zero-emissions buildings. Some examples are highlighted in Table 10.1.

Table 10.1 Selected national targets for low-energy buildings

Country	Low-energy target
Austria	Planned: social housing subsidies only for passive buildings as of 2015
Denmark	By 2020 all new buildings use 75% less energy than currently enshrined in code for new buildings. Interim steps: 50% less by 2015 , 25% less by 2010 (base year=2006)
Finland	30–40% better than standard buildings by 2010; passive house standards by 2015
France	By 2012 all new buildings are low-energy buildings; by 2020 new buildings to be energy positive
Germany	By 2020 buildings should be operating without fossil fuel
Hungary	New buildings to be zero-emissions buildings by 2020, and for large investments by 2012
Ireland	60% less energy than current standards by 2010, net zero energy buildings by 2013
Netherlands	25% less energy than current standards by 2010, 50% less energy than current standards by 2015, energy neutral by 2020
United Kingdom (England and Wales)	New homes to be 44% lower carbon than current standards by 2013 and zero carbon as of 2016. New non-domestic buildings to be zero carbon from 2019.

Source: European Commission, *Low energy buildings in Europe: Current state of play, definitions and best practice*, Brussels, 25 September 2009, www.ec.europa.eu/energy/efficiency/doc/buildings/info_note.pdf, accessed 23 June 2010.

10.5 Expected benefits and costs

Expected change in energy and emissions

The proposals put forward in this chapter are enabling measures and as such no direct estimates of energy savings or emissions reductions have been made. Enabling measures facilitate energy savings or emissions reductions made through other programs, or by households or businesses independently of additional policy action.

Notes

1 ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010.

2 Australian Sustainable Built Environment Council Climate Change Task Group, *The second plank update*, prepared by the Allen Consulting Group, June 2010; see also the Property Council of Australia's submission to the Task Group.

3 COAG communiqué, 7 December 2009, www.coag.gov.au, accessed 29 June 2010.

4 See www.infrastructureaustralia.gov.au/mcu.aspx.

5 Commonwealth of Australia, *The Australian Environment Act: Report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999*, October 2009, www.environment.gov.au/epbc/review/index.html, accessed 29 June 2010.

6 Master Builders Association submission to the Task Group — based on ABS statistics.

7 Property Council of Australia submission to the Task Group.

8 National Housing Supply Council, *2010 State of Supply Report*, Chapter 2, 'Demand for housing', www.nhsc.org.au, accessed 8 July 2010.

9 Australian Carbon Trust submission to the Task Group.

10 ClimateWorks, p. 13.

11 Australian Sustainable Built Environment Council Climate Change Task Group.

12 Note that the term 'commercial buildings' is used for all non-residential' buildings, and includes office buildings, hospitals, schools, shopping centres, and so on.

13 See chapter 3 of the National Strategy on Energy Efficiency (NSEE) for a full description of these measures.

14 See NSEE, section 2.2.

15 Such complexity is not a problem in itself, unless it causes avoidable costs to business, fragmentation, duplication or confusion. For example, if different regulations are in place in different states this may raise costs to national businesses, as they will need to understand the policy mix and then comply with multiple standards.

16 For example, see the submissions to the Task Group by the Property Council of Australia, the Master Builders Association and the Alliance to Save Energy.

17 Examples of the broader benefits that could be assessed are improved liveability, productivity, market competitiveness and reduction in lease vacancies.

18 There may be synergies in linking the NSEE buildings framework with any process to develop a pathway towards zero-emissions buildings.

19 See the submissions to the Task Group by the Property Council of Australia and the Australian Sustainable Built Environment Council.

20 See the Property Council of Australia submission to the NSEE Buildings Framework for standards, assessments and ratings, p. 13.

21 Australian Building Codes Board, *Regulatory impact assessment for the Residential Building Code of Australia,* 2009.

22 These tools would ideally be based on sound science and seek to enhance existing tools where practical.

23 For example, this was requested in the Master Builders Association submission to the Task Group.

24 B Metz, OR Davidson, PR Bosch, R Dave & LA Meyer (eds), *Climate change 2007: Mitigation of climate change*, contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, technical summary, 2007.

Delivering innovation — 'energy-efficient hubs'

Demonstration of large-scale energy efficiency opportunities in buildings and industry can accelerate the commercialisation of innovative step-change energy technologies and solutions.

Bringing together public and private players in urban, industrial or rural regions to benefit from enhanced collaboration in the way energy is generated, transmitted and used could provide a platform for large and sustained gains in energy efficiency.

'Energy-efficient hubs' would be geographic areas featuring industrial, commercial and/or residential sites where a range of parties come together to test, integrate, improve, develop and support cutting-edge energy technologies, business models and solutions.

Building on past successful programs such as Solar Cities, an energy-efficient hubs initiative could overcome market impediments to energy efficiency innovation by testing district-scale energy efficiency and distributed generation solutions.

As outlined in chapter 6, a large proportion of Australia's abatement opportunities will involve unlocking energy efficiency opportunities that are currently poorly understood.

Governments here and abroad have long recognised that there is a case for supporting research and development, and sometimes commercial-scale demonstration, of new and potentially breakthrough technologies. Energy efficiency is no different.

Support for demonstration projects will be particularly important as we explore the impact of new technologies and evaluate the outcome of new ways of thinking.[1] Learning what does not work — in a transparent and rigorous manner — is at least as important as learning what does.

11.1 The potential and the challenge

Innovation and market deployment of new energy solutions could play an important role in improving Australia's energy efficiency performance over time (see Box 11.1).

Box 11.1 Potential of emerging technologies to improve energy efficiency in Australia

The recent ClimateWorks Australia report, *Low carbon growth plan for Australia*, suggests that emerging energy technologies (in particular, cogeneration, wind and solar) could offer large abatement opportunities across the power generation, industry and buildings sectors if deployed more widely.[2] The report estimated, for example, that if Australia's industrial cogeneration potential was further exploited, it could abate 4–5 Mt CO_2-e in 2020 and provide a net financial benefit to society.[3]

In its *Intelligent grid* report, CSIRO suggests that, in a carbon-constrained environment, energy efficiency, distributed generation and demand management technologies could be extremely valuable.[4]

However, innovative energy solutions face a number of technical, economic, information and regulatory barriers and market failures that will not necessarily be overcome by a carbon price, at least in the early years.

Traditional and centralised methods for generating, distributing and using energy prevail in Australia. Technology and infrastructure lock-in, as well as regulatory requirements, still impede market penetration of new entrants such as cogeneration proponents (see Appendix H).[5]

New technologies also suffer from a lack of proven reliability and durability. Scaling up from laboratory pilots to larger plants in real conditions can lead to unexpected technical challenges such as design, installation, operating or maintenance issues.[6] During the early commercialisation phase, businesses often take large investment risks. These do not always pay off immediately and new ventures can fail (this period is referred to by Garnaut and others as the 'valley of death').[7]

Emerging technologies are also generally more expensive and risky than the existing alternatives they compete with. Their commercial viability is often only theoretical or long-term, which does not meet businesses' usual preference for investment options with short and safe paybacks (see chapter 8).[8]

Even established energy-efficient technologies are sometimes underutilised because of information barriers (lack of awareness, understanding and acceptance of new technologies). High transaction costs and implementation complexities can also undermine investments in known energy efficiency improvement opportunities.[9]

Finally, the 'first mover' (or early adopter) disadvantage can hinder the take-up of energy efficiency opportunities.[10] This occurs when early adopters of a technology create beneficial 'spillovers' for subsequent adopters (skills, information, regulatory, and so on) but without receiving the full reward for these positive externalities.[11] This market failure acts as a disincentive for investment.

In all these areas, energy efficiency is no different from other areas of endeavour and technological development.

Energy efficiency, though, offers an additional opportunity and challenge.

While there may be limits to the extent to which individual firms can quickly improve their own energy efficiency, there may be potential for production by-products to be used by others in ways that are not commonly found (such as the supply of by-product hydrogen from one chemical plant to a utility gas provider).[12] By facilitating re-use, rather than waste, Australia may be able to reduce its energy intensity in aggregate even if individual firms' energy efficiency is unchanged.

Well-targeted intervention by governments at all levels in energy efficiency innovation could help increase the scope of current private sector energy efficiency efforts.

As such, there may be potential to draw together a range of industries and other groups in a defined geographic area to benefit from enhanced collaboration in the way energy is generated, transmitted and used.

Fortunately, Australia already has some experience in the efficient sharing of resources among users. Examples include the development of common-use infrastructures (see Box 11.2).

Programs such as Solar Cities (see Box 11.3) have shown the effectiveness of bringing together a range of disparate stakeholders to test, integrate, improve, develop and encourage new (and existing) energy technologies and business models, and by doing so, maximise synergies in energy use and energy efficiency.

Building on existing models, and complementing new programs such as Smart Grid, Smart City, well-targeted intervention by governments at all levels in energy efficiency innovation could help increase the scope of current private sector energy efficiency efforts and support the demonstration of innovative step-change energy solutions.

Box 11.2 Building synergies — common-use infrastructure in the gas industry

The gas industry provides an interesting example of building synergies and the development of 'common-use infrastructure'. Common-use infrastructure involves the cooperation of several businesses in the construction of a single large processing infrastructure (instead of several smaller and separate plants). This enables each participant to share the benefits from the economies of scale of a bigger plant. A 2008 report from Wood McKenzie found that common-use gas infrastructure could save around $1 billion in transport and processing costs.[13]

11.2 Existing measures

Innovation in energy efficiency, distributed generation and high-performing buildings is currently encouraged through a number of programs at the Commonwealth, state and local levels. These include:

- the Australian Government's Solar Cities program, which aims to demonstrate the environmental and economic effects of combining cost-reflective pricing with the widespread use of solar technology, energy efficiency and smart meters, delivered through innovative business partnerships (it also aims to investigate barriers to energy efficiency, electricity demand management and the use of solar technology, and test ways to deal with these barriers)[14]

- the Australian Government's Green Building Fund, which provides funding for upgrades of individual commercial office buildings[15]
- the Australian Carbon Trust, which will trial innovative financing options to support retrofits of existing commercial buildings[16]
- several jurisdictional initiatives, such as Zero Emission Neighbourhoods, the Victorian Government's $6 million grant program, designed to showcase and help shape the future of sustainable residential developments in Victoria.[17]

Solar Cities and other programs provide an effective model for demonstration projects. Building on the lessons learned from these programs and complementary new initiatives (such as Smart Grid, Smart City) would provide an opportunity to:

- apply the successful Solar Cities approach to new sectors and stakeholders, in particular industry and the buildings sector
- test innovative financing models such as property assessed clean energy financing, known as PACE financing (see Box 11.6)
- trial new energy solutions at a district scale and across various regions of Australia.

Box 11.3 Solar Cities — the Magnetic Island Solar Suburb[18]

The Magnetic Island Solar Suburb (an Ergon Energy demand reduction program) has been successful in reducing peak and overall electricity demand on the island and therefore deferring investment in an upgrade of the electricity cable running to the island. Average peak electricity demand has declined by 24 per cent compared to demand projections before implementation.

The project has delivered practical applications of solar energy, and demonstrated multiple ways to use high-quality photovoltaics, while collecting results on the operation of the technology in the tropics. More than 150 photovoltaic systems are now in place, representing over 350 kilowatts of electrical generating capacity.

There has been excellent community engagement, with residents hosting panels for no individual financial gain. Over 70 per cent of the island's population (more than 1,100 homes and businesses) have had free energy assessments.

The project is on track to reach two of its most important objectives: reducing energy infrastructure requirements to meet the peaks and demonstrating effective methods for reducing greenhouse gas emissions.

Building on the successes achieved so far, Ergon Energy has decided to apply lessons from the Magnetic Island project at Mackay, Mt Isa, Torres Strait, Woorabinda, Rockhampton, Cairns and mainland Townsville.

11.3 The case for energy-efficient hubs

> Business and government at regional and city level have a critical role in developing, scaling up and applying low-emission technologies at the frontline. Their leadership, based on past experience gives national governments clear case studies of what works in practice and their new ideas are essential to stimulate investment and innovation.
>
> Yvo de Boer, UNFCCC Executive Secretary[19]

Applying the lessons of existing initiatives has led the Task Group to consider the case for energy-efficient hubs.

These hubs could be geographical areas (districts, regions, cities featuring industrial, commercial and/or residential sites) where a range of players are brought together to test integrate, improve, develop and encourage cutting-edge technologies, business models and solutions in the areas of energy efficiency and distributed generation.

Energy-efficient hubs could be constructed as a series of pilot projects where the private and public sector would collaborate and coordinate research, development and demonstration activities showcasing large-scale energy efficiency opportunities. This would encourage energy efficiency and distributed generation industries to mature and, through the trialling of additional systems, help emerging technologies move one step closer to the critical mass required for mass market commercialisation.

Showcasing large-scale energy efficiency opportunities … would encourage energy efficiency and distributed generation industries to mature.

Energy-efficient hubs could explore and possibly validate step-change solutions in the following three main areas:

- *industrial hubs* that would demonstrate energy synergies (and energy efficiency/distributed generation technologies) in regional network-constrained areas, and manufacturing and mining activities
- *net zero-emissions urban hubs* that would showcase new high-technology and low-emissions residential buildings and precincts
- *central business district hubs (CBD hubs)* that would feature retrofits for highly energy-efficient commercial buildings and district-scale energy solutions.

These hubs would, where possible, be connected to the main networks (electricity, gas, roads, telecommunications) so they could export and receive energy or resources from neighbouring sites. They could also be designed to expand over time into nearby built or rural environs.

Box 11.4 A representative energy-efficient hub — what could it look like?

A typical energy-efficient hub could, for instance, be a residential neighbourhood trialling all or some of the following elements:

- low-consumption residential units showcasing optimal orientation and insulation, as well as solar panels, natural ventilation and a range of other best practice technologies
- a large-scale trigeneration plant providing district electricity, heating and cooling to the area through a private wire network[20]
- new contractual arrangements between energy retailers or local councils, energy service companies and the residents to deliver new energy services
- recovery and exploitation of waste
- a local community facility such as a hospital or indoor public swimming pool receiving heat from a medium-scale cogeneration plant
- as well as a range of other smaller-scale power plants, such as solar photovoltaic for activities such as street lighting
- high use of energy-efficient appliances and transport options.

Industrial hubs

The industry sector is a major user of energy in Australia. Even small energy efficiency gains across the 200 largest energy-using corporation would result in significant gains for Australia overall (see chapter 8).

Re-using waste heat or other energy by-products from one transformation process into another site can improve the energy efficiency performance of these facilities, even though the actual efficiency of each is unchanged.[21] While this would seem to provide an incentive for industry to develop such 'clustering' arrangements, in practice collective synergies among sites can be difficult to achieve without shared vision and strong collaboration among users.[22]

The Government may, therefore, wish to consider facilitating the development of projects within industrial hubs to showcase:

- recovery and re-use of resources that might otherwise be wasted between industrial, businesses and/or residential sites
- energy efficiency and distributed generation technologies
- innovative energy distribution solutions such as the private wire model.

Action in this area would aim to test the benefits of industrial synergies, and explore options to create and exploit over time further energy efficiency improvements.

Box 11.5 Kwinana Industrial Park, Western Australia[23]

The Kwinana Industrial Park was founded in the 1950s when the state government secured 120 square kilometres of land to be dedicated to major resources processing activities. This helped kick-start relationships between companies located within the site, such as the Kwinana cogeneration plant located on a refinery site.[24]

This cogeneration plant produces all the process steam required for the refinery and generates electricity for the site as well as for the grid. The cogeneration plant is fired with natural gas supplemented with excess refinery gas from the oil refinery. This synergy led to the decommissioning of inefficient boilers—estimated to have saved the refinery in the vicinity of $15 million in capital expenditure.

Net zero-emissions urban hubs

Improving the energy efficiency performance of new buildings is important to avoid 'locking-in' inefficient infrastructure, noting buildings typically last for some 30–80 years. However, constructing energy-efficient buildings can be a complex exercise. (See section 10.1 for a more detailed description of the challenges involved.)

Net zero-emissions urban hubs could help address these challenges by demonstrating, developing experience and building up a critical mass of skills and projects in the construction of leading-edge low- or zero-emissions residential developments.

Within residential developments, there is scope for this proposal to demonstrate:

- new technologies and business models in the design, planning and construction of new facilities
- new performance requirements underpinning future minimum energy standards
- highly efficient distributed generation solutions using emerging technologies
- innovative funding mechanisms—such as potentially, property assessed clean energy financing, or PACE financing[25] (see Box 11.6)
- new tariff solutions and metering technologies (such as smart meters and time-of-use pricing)
- the benefits of energy efficiency and smart urban planning to energy networks.

The ambition of net zero-emissions urban hubs would be to smooth the pathway for new highly efficient residential developments — by lowering commercial risks of new business models, building up the necessary knowledge (based on improved data and trade skills) and creating successful project precedents. In doing so, it could help prove the case to (1) raise the bar for future minimum building codes and (2) demonstrate avoided costs of new electricity network infrastructure.

The ambition of net zero-emissions urban hubs would be to smooth the pathway for new highly efficient residential developments.

Box 11.6 Trialling of PACE financing—how would it work?

Some hub projects could be an opportunity to test various innovative financing models, such as PACE financing. One possible PACE financing model is presented below.

A qualified energy service company (ESCO) conducts a detailed assessment of energy efficiency opportunities in a residential building

↓

The ESCO informs the building owner of identified opportunities

↓

The building owner and ESCO apply to the city council for approval and funding of the selected opportunities identified

↓

If approved, the ESCO is paid by a finance provider to conduct the work
The building owner does not pay any upfront costs

↓

The building owner pays back the cost over time through increased land rates

↓

The building owner benefits from increased leasing rates, higher efficiency rating and savings in energy costs — which exceed the increased land rates

↓

The tenant enjoys a more efficient building and lower energy bills

↓

If the building is sold, the increased land rates are transferred to the new owner

As this theoretical example shows, PACE financing provides benefits to all stakeholders involved:

- The building owner would get reduced upfront payments, lowered energy bills over time and, through these, financial savings that would be greater than the increased costs of property taxes.
- Finance providers would have enhanced security in energy efficiency investments, as these would be tied to land rates.
- Energy service companies would gain additional business opportunities.
- City councils would be able to access funding mechanisms for energy efficiency investments that have lower impact on their budget.

Note: PACE financing could be an option across both residential and commercial buildings.

Central business district hubs

Existing commercial buildings offer large energy savings opportunities.[26] However, common barriers to energy efficiency in buildings (split incentives, information asymmetries, as well as impediments to innovation) prevent these opportunities from being fully exploited (see chapter 10).

Consideration could be given to actions within CBD hubs that would seek to address barriers in the sector and grasp the opportunities offered by the commercial buildings sector — with an emphasis on precinct scale solutions. An example would be trialling large-scale trigeneration to provide district cooling, heating and power.

The objective would be to make high-performing commercial buildings the norm and help equip the building industry so it is well placed to take up innovative solutions to maximise energy efficiency outcomes.

As with industrial hubs and net zero-emissions hubs, CBD hubs could demonstrate new technologies, business solutions and financing mechanisms but would focus on retrofits and upgrades of the existing commercial buildings stock.

CBD hubs would provide an opportunity to collect information on the costs and benefits of high-performing buildings, such as data on reduced lease vacancies. They could also help prove the value to energy networks of energy efficiency and distributed generation and identify areas where barriers still remain.

Box 11.7 Trialling of trigeneration and district cooling and power in a CBD hub

Trigeneration is the combined production of electricity, heating and cooling through recovery and re-use of waste heat, which helps maximise the use of the initial source of energy. Trigeneration can be particularly efficient in applications such as district cooling and data centres (through economies of scale and avoided start-up and shut-down losses).[27] By installing a trigeneration plant in one of its data centres, National Australia Bank has reduced its energy demand from the grid by approximately 16 GWh of electricity per year. Avoided network losses and switching from brown coal electricity to natural gas have led to a reduction of carbon emissions (in the order of 20,000 tonnes per annum).[28]

According to the Australian Energy Network Association, 57 per cent of future energy network augmentation investments would come from the need to accommodate additional air-conditioning demand.[29] A 2004 study from the Western Australia Office of Energy also found that for every additional air-conditioning unit worth $1,000, an additional investment of $6,000 into generation and network infrastructure was required.[30]

By providing cooling on hot days, trigeneration can reduce peak energy demand and lower network augmentation costs. Energy-efficient hubs would provide an opportunity to measure these benefits and assess the potential for clean and efficient district cooling solutions in Australia.

Energy-efficient hubs could test and, potentially, validate the long-term technical reliability of break-through technologies and business models.

11.4 Expected outcomes

Energy-efficient hubs could test and, potentially, validate the long-term technical reliability of break-through technologies and business models in industry and buildings. Projects and dissemination of best practices would help build the technical capacity (information, data, skills) required for mass-market deployment and trials of a broad range of products would help avoid technology lock-in.[31]

Energy-efficient hubs could help gather useful information on the commercial viability of new energy solutions, such as the potential of new technologies to reduce energy bills over time. Through a trialling of additional systems, energy-efficient hubs could also provide incentives for achieving economies of scale and help accelerate the commercialisation of validated energy solutions.

Energy-efficient hubs could provide useful energy network data for future projects (through use of smart meters, for instance), and demonstrate how distributed generation (and energy efficiency technologies) could potentially help alleviate network constraints and better manage peak demand (see Box 11.7).

As 'a test bed for more significant regulatory reforms', actions within energy-efficient hubs could build useful experience and information for future policy and regulatory developments.[32]

11.5 Implementation

If the Government were to proceed with the development of energy-efficient hubs, some activities would be better suited for phased introduction and others could be conducted initially as pilots.

Building upon successful programs such as Solar Cities, the private and public sectors could be encouraged to share the costs and risks of new commercial ventures and form funding consortiums. A range of financial mechanisms beyond grants could be explored, such as guaranteed loans.

The number of projects supported would need to take account of the fiscal situation and could vary depending on the amount of private sector funding leveraged and the number of proposals received. A variety of geographical areas could be chosen to test different operating conditions (in tropical, or temperate climates, for instance), system configurations and applications (solar and wind in remote areas, or district trigeneration in high-density urban areas).

The best approaches and funding models for each element of this proposal would warrant further consideration before any decision on broader-scale implementation.

Notes

1 International Energy Agency, *Energy technology transitions for industry, strategies for the next industrial revolution*, 2009.

2 The ClimateWorks report estimates that a greater deployment of onshore wind in best locations could abate around 5 Mt CO_2-e in 2020, while solar thermal — if further exploited — could save around 10 Mt CO_2-e in 2020. See ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010, p. 88.

3 ClimateWorks, p. 88.

4 The value of these technologies is estimated at $130 billion per year, at a discount rate of 7 per cent per annum in a Garnaut 450 ppm scenario (with a CPRS commencing in 2013 and an emissions reduction target of 25 per cent by 2020 and 90 per cent by 2050 compared to 2000 levels). For the purposes of comparison, this represents more than the annual Australian Government spending on social security and welfare — $110 billion in the current financial year. See www.budget.gov.au.

5 Smart Grid Australia submission to the Task Group.

6 Australian Meat Industry Council submission to the Task Group.

7 During the 'valley of death' period, a technology can fail because its technical viability is not immediate. See R Garnaut, *The Garnaut Climate Change Review: Final report,* Cambridge University Press, Melbourne, 2008.

8 Nuclear Energy Agency & International Energy Agency, *Projected costs of generating electricity*, 2009.

9 Garnaut, 2008.

10 Energy Efficiency Council submission to the Task Group. A 'first mover disadvantage' occurs when individuals or businesses bear the majority of costs associated with a project which actually benefits to a range of other individuals or businesses over time. An example of this is when a cogeneration proponent pays for gas infrastructure augmentations, while 'subsequent cogeneration developers are only required to pay the ongoing service fee'.

11 In this case, 'spillovers' refers to the beneficial outcomes of the action of early adopters (body of knowledge and experience, improved skills, reduced costs, enhanced social acceptance) that can be used by following adopters at no cost.

12 See www.csrp.com.au/database/au/kwin/csbp_h2_airliquide.html, accessed 30 June 2010.

13 This report compared two different scenarios: (1) three independent plants processing gas from three separate sources and (2) one large integrated plant processing gas of the three separate sources. See DomGas Alliance, *Promoting domestic gas supply through common-use infrastructure*, 2008.

14 See www.climatechange.gov.au (Solar Cities and Smart Grid, Smart City).

15 See www.ausindustry.gov.au (Green Buildings Fund).

16 See www.climatechange.gov.au (Australian Carbon Trust).

17 See www.resourcesmart.vic.gov.au.

18 Australian Government, Solarise, 2010 and 2009, at www.climatechange.gov.au (Solar Cities).

19 The Climate Group, Press release: *UN climate talks: World's states and regions sign Bonn Statement on road to COP16*, 2 June 2010.

20 This model was successfully tested in the United Kingdom (Working Council). It exempts small generators, distributors and suppliers from certain licensing requirements.

21 ClimateWorks, 2010.

22 Industrial synergies (or symbioses) arise among sites when traditionally separate industries engage in a collective approach to exchange materials, energy, water and/or by-products and yield collective benefits greater than the sum of individual benefits. See C Marrian, *Industrial symbiosis: Literature and taxonomy*, 2007.

23 See www.csrp.com.au/database/au/kwin/bp_cogen.html.

24 S Roshni, *Industrial ecology: Oxymoron, or the way of the future?*, 2009.

25 The trial of PACE initiatives is likely to be dependent on local and state government support.

26 ClimateWorks (2010) estimates that the buildings sector has the potential to contribute to 11 per cent of the total 2020 lowest-cost emissions reduction opportunity for Australia, and that 77 per cent of this opportunity is within the commercial sector.

27 Natural gas trigeneration can be a viable solution for data centres, which are significant consumers of energy, by providing electricity and cooling. CSIRO modelling found this could save large quantities of CO_2-e and costs with high rates of return. See CSIRO, *Intelligent grid: A value proposition for distributed energy in Australia*, 2009.

28 National Australia Bank.

29 Total network augmentation costs are estimated at $2.5 billion over five years. Report commissioned by Energy Networks Australia, *Energy network infrastructure and the climate change challenge*, 2009.

30 Western Australia Office of Energy, *The impact of residential air-conditioning on the Western Australian electricity system*, 2004.

31 Australian Meat Industry Council submission to the Task Group.

32 Smart Grid Australia submission to the Task Group.

Energy markets

Australia's gas and electricity markets are a major part of our energy framework. Generators and distribution and transmission networks are also important users of energy. Improving the way in which the market operates in relation to energy efficiency, as well as the efficiency of energy generation and distribution, would make a substantial contribution to a step-change improvement in Australia's energy efficiency.

To play its part in enabling a step change in energy efficiency, the energy market needs to be both flexible and robust. Ongoing reform of the National Electricity Market (NEM) has improved its consideration of demand-side options (including energy efficiency). But concerns remain that aspects of the NEM regulatory structure may be hindering the take-up of cost-effective energy efficiency opportunities. Achieving a step change in the nation's energy efficiency will require that NEM participants have appropriate incentives, and are equipped to deliver cost-effective demand-side measures and to partner effectively with providers of energy efficiency and demand management services.

This chapter considers a package of options across the Australian energy market to:

- improve generator efficiency and reduce network losses
- improve the balance of demand-side options and new network infrastructure in the NEM
- reduce remaining barriers to energy efficiency and demand-side options in the NEM
- improve the focus on energy efficiency in the NEM.

In 2007–08, Australia produced 17,360 petajoules of energy from a variety of sources — predominantly coal, gas and oil. Two-thirds of domestic energy production was exported, and domestic consumption accounted for the remaining third.[1]

Domestically consumed energy may be used directly by industries and households but is generally first transformed in refineries and power plants for use as petroleum products and electricity.

12.1 Electricity markets

Peak growth will require substantial investment in Australia's electricity infrastructure to maintain reliability standards.

The electricity generation sector in Australia accounts for more than 30 per cent of Australia's primary energy consumption.[2] Most of Australia's electricity is produced using coal, which accounted for 76 per cent of total electricity generation in 2007–08. Coal is a relatively low-cost energy source in Australia, reflecting the abundance of coal reserves along the eastern seaboard, where most electricity is generated and consumed.

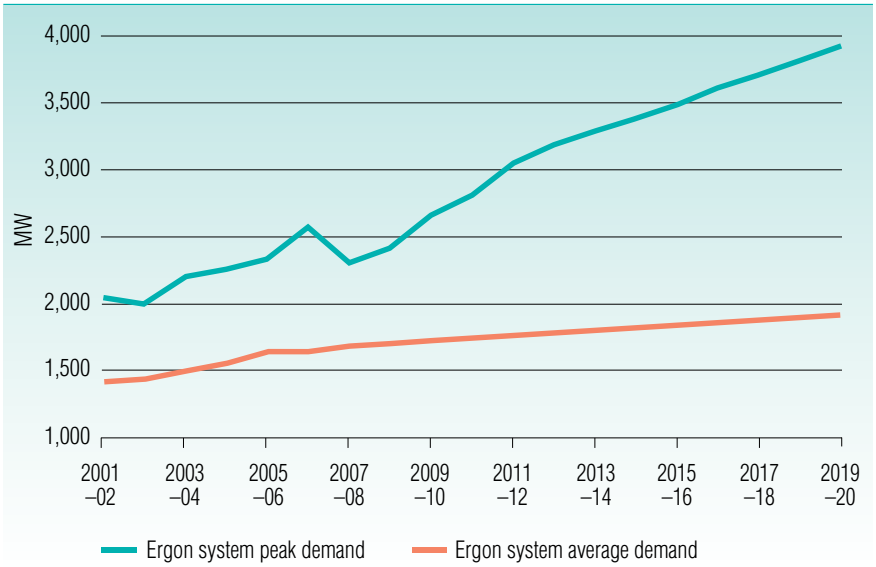
The electricity market, consisting of generators, transmission and distribution networks and retailers, is one of Australia's largest industries and contributed 1.4 per cent to Australian industry value added in 2007–08. Over the 10 years from 1997–98 to 2007–08, Australia's electricity use increased at an average rate of 2.8 per cent a year. This trend is likely to continue as Australia's population and economy continue to expand, requiring new investment in generation, transmission and distribution infrastructure.

As 8 to 10 per cent of electricity generated is lost through the distribution and transmission networks before it gets to end users, improvements in the efficiency of transport of electricity could be material in reducing final energy use. The cost of these losses is paid by retailers and passed on to consumers, resulting in a split incentive for network owners, who in many cases could reduce losses but cannot recoup any investment costs from doing so.

The current structure of Australia's southeastern electricity market was shaped by extensive ongoing industry reforms that began in the early 1990s. A key element of the reforms was the establishment of the National Electricity Market in 1998, which allowed market-determined power flows across the Australian Capital Territory, New South Wales, Queensland, South Australia and Victoria (Tasmania joined in 2005). Because of their geographic distance, Western Australia and the Northern Territory are not connected to the NEM; nor do they share institutional structures.

Energy used for electricity generation is projected to increase by some 9 per cent between 2009–10 and 2019–20.[3] Electricity use at peak times is growing faster than total electricity use (see Figure 12.1), largely due to increasing use of air conditioners. Peak growth will require substantial investment in Australia's electricity infrastructure to maintain reliability standards. This growth, combined with the need to replace ageing assets, will require more than $42 billion of investment in networks over the next five years.[4] The resulting increase in network charges is, and will remain, a key driver of future increases in electricity prices (see the discussion of electricity prices in chapter 1).

Figure 12.1 Example of peak demand growing faster than total energy use



Source: Ergon Energy submission to the Task Group.

Energy efficiency measures can help reduce the need for new electricity infrastructure investment in the future, especially if such measures reduce demand at peak times.

Energy efficiency measures can help reduce the need for new electricity infrastructure investment in the future, especially if such measures reduce demand at peak times. This would reduce costs and improve Australia's energy security.

In the past, cost-effective demand-side alternatives to electricity network investments (such as energy efficiency and distributed generation) may not have been adequately considered. Reasons for this include lack of balance between supply and demand options and lack of support for innovative approaches in regulatory frameworks; lack of confidence in newer technologies and approaches; the form of reliability standards; and the lack of cost and planning transparency. Changes have been made in the NEM in recent years to address some of these issues, but many participants in the Task Group's consultations argued that the balance between supply-side and demand-side measures is still far from optimal (see section 12.3).

12.2 Gas markets

Natural gas is Australia's second largest fuel source for electricity generation, accounting for 16 per cent of electricity generation in 2007–08. The share of natural gas in Australian energy production has increased in recent decades, and this trend is likely to continue in the longer term as gas continues to be a cost-efficient alternative to coal in a carbon-constrained environment and with increasing commercialisation of reserves.

One of the aims of energy market reform has been to recognise the growing links and interdependencies between the electricity and gas markets. This is reflected in the development of a national energy legislation framework encapsulated in the National Electricity Law and Rules and the National Gas Law and Rules. This legislation has advanced the regulatory convergence of the gas and electricity markets by transferring regulatory responsibilities of electricity and gas transmission and distribution networks (in all states except Western Australia) to the Australian Energy Regulator (AER), and responsibilities for market development to the Australian Energy Market Commission (AEMC). Similarly, the establishment of the Australian Energy Market Operator (AEMO) on 1 July 2009 was a significant milestone in the increasing convergence of the gas and electricity markets across Australia.

Losses from gas pipelines are difficult to quantify and are variable; estimates range from quite low to over 6.5 per cent in some regions.[5] Losses relate to leaks from

physical deterioration of distributed pipe networks, gas used in compression and metering issues. Lack of comparability between reporting methodologies means that losses in some regions may be under-reported.[6] Like electricity network losses, gas losses involve a split incentive, with costs passed on to consumers via retailers and pipeline service providers unable to capture the benefits of reduced losses to pay for investment. Leakage of natural gas can have a large greenhouse impact, as methane has a global warming potential 21 times that of carbon dioxide.

In contrast to the electricity market, which must balance supply and demand instantaneously, pipelines are a means of storage as well as a method of transportation. For this reason many of the peak energy management issues in the electricity market (including demand-side management, distributed generation and efficient time-of-use price signals) do not have a direct parallel in the gas market.

12.3 The energy market challenge

Unless Australia's electricity and gas markets generate and transport energy efficiently, all Australian energy end-users face higher energy bills than necessary.

As noted above, many observers suggest that aspects of the operation and regulatory structures of the NEM may inhibit the take-up of energy efficiency and demand management measures, including distributed generation, resulting in higher electricity costs and higher infrastructure investment.

Almost a quarter of submissions to the Task Group argued that the NEM is excessively supply-side focused, and fails to effectively balance the incentives and obligations for supply and demand solutions.

> Although investing in energy efficiency and distributed generation would often provide the same capacity at much lower costs to the public, the NEM rules strongly favour investing in more expensive networks and centralised supply.
>
> Energy Efficiency Council submission to the Task Group

> Currently, the ways electricity distributors and retailers are regulated effectively limit their ability to find better ways to manage electricity demand.
>
> Integral Energy submission to the Task Group

> Barriers in the following three areas, in particular, may impede the achievement of energy efficiency objectives: (1) transparent and cost-reflective price signals; (2) access to information and knowledge on Demand Side Participation options; and (3) incentives to promote research and innovation to develop and use new technologies … The current incentive framework has a gap in the way it values distributed generation's contribution to avoided network capex.
>
> Origin Energy submission to the Task Group

> The current connection rules and arrangements of the National Electricity Market (NEM) act as a disincentive to the deployment of such projects [cogeneration and trigeneration] and the rules need to be altered to make it easier to connect projects.
>
> Clean Energy Council submission to the Task Group

Other submissions to the Task Group noted that recent and ongoing work in reforming the NEM arrangements is improving the balance between demand and supply solutions (see section 12.4 for a discussion of these reforms).

> Two major reforms have taken place in the last three years which have changed the way in which network companies approach non-network investment and demand management. The first was the introduction of the new Chapter 6 of the National Electricity Rules (Rules) which ... have led to non-network alternatives becoming a part of distributors' mainstream planning processes. The second was the introduction of the Demand Management Incentive Scheme.
>
> Ergon Energy submission to the Task Group

If Australia's energy markets are to be robust and flexible enough to meet the challenges of a step change in energy efficiency, the NEM needs to effectively balance investment decisions, by supporting consideration of both demand and supply options and ensuring that the most cost-effective solutions are supported in all cases. NEM participants and energy efficiency and demand management providers should be able to effectively identify and implement solutions to help the economy make the transition to a future carbon price.

The NEM needs to effectively balance investment decisions, by supporting consideration of both demand and supply options.

12.4 Existing measures

When the NEM commenced in December 1998, the market rules did not specifically provide for equal opportunities for demand-side management, although recent reforms to the rules have brought greater balance.

In December 2003, the Ministerial Council on Energy (MCE) included user participation (including improved demand-side response) in the priority items for further market reform. In 2006 COAG committed to a work program 'to establish effective demand-side response mechanisms in the electricity market, including network owner incentives, effectively valuing demand-side responses, regulation and pricing of distributed and embedded generation, and end user education'.[7] In 2009 the MCE noted the importance of demand-side measures to ensuring the energy market effectively transitions to a low-carbon economy.

Following from these commitments, a range of changes to address barriers to demand-side participation in the NEM have been implemented, including:

- inclusion of a Demand Management Incentive Scheme within the regulatory arrangements for distributors and the requirement for the AER to consider demand management when assessing all aspects of capital expenditure, operating expenditure, services, and efficiency incentives and pricing[8]
- changing the rules relating to the regulatory investment test (the obligation on network businesses to undertake a detailed economic evaluation of proposed investments) to require network businesses to examine non-network alternatives (including demand management and distributed generation) to a planned network investment. A business may not pass through the costs of a network investment unless it satisfies this test.

The impact and effectiveness of these measures will take some time to observe given the five-year investment cycles in networks.

By the end of 2010, the MCE is expected to finalise an amended national connection framework for electricity and gas distribution networks, which should address a range of recognised barriers for distributed generation.

The MCE is also currently developing the new National Framework for Electricity Distribution Planning and Expansion. In June 2010, the MCE agreed to a policy response to the final report of the AEMC's review of the framework. The MCE is expected to progress the implementation of the new national framework through

the AEMC rule change process. The framework is intended to enhance transparency in planning and decision-making to address constraints.

In addition, one of the most fundamental changes to be implemented by the MCE is the commitment to roll out smart meters for small customers (including most households and small businesses), along with the ongoing complementary trials of smart grid technologies supported by the Commonwealth. Smart meter and grid technologies will fundamentally change the tools available to consumers, retailers and networks for increasing energy efficiency. New tools could include visible real-time monitoring and enhanced information (for both consumer response and loss detection), a wide range of off-peak tariffs, and direct load control of appliances.[9] However, this program will necessarily take some years due to the scale of technology change, the need to properly understand how to make the best use of the technology to deliver enhanced services, and the challenges of transitioning consumers from historic arrangements to more cost-reflective pricing. Victoria is aiming to complete the roll-out of smart meters by 2014. New South Wales is aiming for 2017, and pilots are being considered in other jurisdictions.

The Task Group supports the principle that investment in demand-side options should occur when it is more cost-effective than, and provides the same level of energy security as, supply-side options.

NEM institutions are working in this area as well. The AEMC is undertaking a review of demand-side participation in the NEM; it released a final report for stage 2 of the review in December 2009. In June 2010, the MCE agreed to a response supporting a number of the AEMC recommendations, such as a review of technical connection standards for embedded generators, and re-balancing incentives for expenditure on non-network solutions that occurs across multiple regulatory periods. The AEMO also has a supporting work stream, 'Minimising Barriers to Cost-Effective Small Generator Participation in the NEM', which is looking at issues such as market registration for distributed generators.

COAG (through the National Strategy on Energy Efficiency) has tasked the MCE with reviewing and developing actions to address electricity market barriers that limit the take-up of cost-effective energy efficiency opportunities. The MCE has identified, in conjunction with its response to the AEMC demand-side review, some further areas of work on elements of this task.

It is important to note, however, that because these work streams are relatively new, their full impact is yet to be realised in the NEM, and it is too early to assess their effectiveness. Notwithstanding these existing changes and current work streams, improvements in energy efficiency have been slow and many observers believe more can be done.

While the AEMC, in its 2009 demand-side participation review, concluded that the NEM framework does not materially bias against the use of demand-side participation, in practice there has been no significant increase in activity or investment in energy efficiency in the NEM. Accordingly, the Task Group considers that some relatively small but fundamental adjustments to NEM frameworks could lead to noticeable improvements in the take-up of energy efficiency opportunities.

The Task Group supports the principle that, consistent with existing NEM rules, investment in demand-side options (energy efficiency and distributed generation) should occur when it is more cost-effective than, and provides the same level of energy security as, supply-side options. Distributed generators should have the same ability to export energy to the grid and sell it in the market as all other generators.

In addition, a national energy savings initiative that imposes direct requirements on energy market participants to assess energy efficiency opportunities in their own operations, or to invest in energy efficiency improvements in the broader economy, could noticeably improve energy efficiency.

12.5 Options for change in the Australian energy market to support a step change in energy efficiency

While work on reducing regulatory barriers in the NEM is ongoing, some cultural and informational hurdles remain that tend to slow innovation and moves away from well-understood operational models to newer technologies like distributed generation. An energy savings initiative that places a mandatory target on energy market participants could help overcome these barriers and drive the take-up of new ways to manage demand in the NEM. This is discussed in more detail in chapter 4.

The Task Group offers further substantive options for consideration, which could — alongside an energy savings initiative — change the direction of energy market reform and support a step-change improvement in energy efficiency. These options would:

- improve generator efficiency and reduce network losses
- improve the balance of demand-side options and new network infrastructure in the NEM
- reduce remaining barriers to energy efficiency and demand-side options in the NEM
- improve the focus on energy efficiency in the NEM.

These reforms, if adopted, should be delivered through existing governance arrangements to ensure coherence with NEM arrangements and related processes.

Improve generator efficiency and reduce network losses

Option 1: Remove the exemption for generators in the Energy Efficiency Opportunities Act to ensure that they identify possible cost-effective energy efficiency improvements. This change would apply across Western Australia and the Northern Territory as well as within the NEM jurisdictions.

ClimateWorks Australia estimates that operational improvements to existing fossil fuel thermal efficiency could reduce energy use by 3 per cent for brown and black coal plants and 3.5 per cent for gas power plants.[10] This proposal is discussed further in chapter 8.

Option 2: Include electricity and gas transmission and distribution networks in the Energy Efficiency Opportunities Act, and require that they identify measures to reduce losses in the networks where the benefits to the market of doing so clearly outweigh the costs. In addition, it may be appropriate for the AEMC to also consider changing the National Electricity Rules to ensure that electricity network service providers implement these improvements.

Between 8 and 10 per cent of electricity generated, and up to 6.5 per cent of gas, is lost through the network before it gets to end users.[11] While some losses are inevitable, ClimateWorks Australia estimates that cost-effective changes could decrease losses by 1 to 1.5 percentage points (in line with loss reductions achieved in the United Kingdom).[12] This proposal is discussed further in chapter 8.

Reducing losses in transmission and distribution lines and pipes means less electricity and gas needs to be generated or supplied to deliver a given amount of electricity and gas to end users. Marginal improvements in the energy efficiency of the transport of energy could be significant in terms of total energy use.

Changes would be required to the National Electricity Rules to overcome the current split incentive — network service providers have the ability to reduce network losses, but energy end users rather than network service providers recoup the economic payback. Several network providers raised this problem in submissions

to the Task Group, and highlighted the need for regulatory changes to allow these opportunities to be captured.[13]

Because this option targets loss reductions where the benefits to the market clearly outweigh the costs, the upfront costs of this measure would be more than offset by the value of decreased losses, resulting in lower electricity and gas costs over time.

Improve the balance of demand-side and new infrastructure options

Option 3: Task the AEMC and/or AER to provide stronger regulatory oversight of the regulatory investment test process.

Network service providers are currently required to assess all proposed network expansions against alternatives (including demand-side management and distributed generation). This requires the network business to provide information to enable interested parties to comment on the justification for the project and the options identified, and to propose alternative solutions where appropriate. The AEMC, in its review of the National Framework for Electricity Distribution Network Planning and Expansion, proposed further improvements in the provision of information and engagement with demand-side proponents, which the MCE recently agreed as Rule changes.

However, assessments by network service providers are not challenged by regulators unless a proponent queries them through dispute processes. This requires interested parties to obtain substantial amounts of information that is only held by the network business. Strong regulatory oversight in this area (which does not depend on dispute processes and could include assigning civil penalty provisions to the key requirements in the process) would assist in transparency and ensure that networks undertake due diligence in these assessments. These compliance issues could be considered as part of the AEMC's consideration of a Rule change relating to distribution network planning requirements (agreed by the MCE in June 2010).

Option 4: Require the AER to review the effectiveness of the Demand Management Incentive Scheme, looking in particular at the option of moving to a national scheme, and opportunities for enhancing the existing scheme to provide stronger incentives for take-up of demand management in the NEM.

The NEM has been changed in recent years to reduce disincentives in network regulation for the take-up of energy efficiency and demand management measures, most importantly with the introduction of the Demand Management Incentive Scheme. Evaluation of the effects of these changes has not yet been possible, though take-up of demand management measures remains slow.

A number of submissions to the Task Group suggested a large expansion to the existing scheme, to drive a step change in new investment in demand management, and to overcome existing cultural and information barriers.

Reduce remaining barriers to energy efficiency and demand-side options

Option 5: Accelerate and expand the current MCE work to streamline distributed generation connection processes (working with the AEMC).

Distributed generators (including cogeneration and trigeneration) encounter many obstacles to connecting to the grid. These include uncertainty over technical standards; a lack of transparency about opportunities to address network constraints; additional network management costs because networks were designed without significant distributed generation in mind; resulting

uncertainty about what costs may reasonably be charged to distributed generators in planning for connection; and the challenge of small generators negotiating with a large monopoly network provider.

> Distributed generation and utilisation of co-benefits such as heat are best driven by: removing the technical barriers to grid connection; …
>
> Origin Energy submission to the Task Group

Work currently being undertaken by the MCE and AEMC to address these issues includes more standardised and simplified connection processes and standard technical connection requirements.[14]

The MCE and AEMC could be tasked to accelerate this existing work and further consider:

- more transparent connection pricing so that it is clearer what the distributed generator should pay to the network service providers in connection costs, and also what the network service providers should pay to the distributed generator to compensate for avoided Transmission Use of System (TUOS) charges and for any network support services
- a distributed generation ombudsman role or other option for improving the ability of distributed generation proponents to resolve technical connection matters
- consolidating distribution planning information in a single consistent report, similar to the Electricity Statement of Opportunities report[15]
- improved arrangements for jurisdictional setting of reliability standards to reduce their impact on levels of distributed generation and demand-side participation.

Option 6: Encourage more efficient, cost-reflective price signals in energy markets, including time-of-use pricing where appropriate (noting that the states and territories have primary responsibility in this area).

The capacity of energy users to make energy-efficient decisions is strengthened if their energy charges accurately reflect costs, including generation and network costs. Without the applicable metering technology to support cost-reflective pricing, it is unlikely that all the opportunities for cost-effective energy efficiency would be realised.

The MCE Standing Committee of Officials has requested the AEMC to consider any barriers to efficient price signals in stage 3 of the review of demand-side participation in the NEM. This should be expanded to include barriers to time-of-day or block tariffs (which can encourage energy efficiency) and mechanisms to encourage retailers to increase the pass-through of price signals to consumers. This would be facilitated if the implications for low-income households were better understood and dealt with explicitly and transparently.

> As electricity network costs are dominated by the capital employed to meet peak demands, the temporal smearing [of costs] implies significant inefficiency.
>
> Australian Energy Market Operator submission to the Task Group

The AEMC should be asked to consider improved forward price transparency. This is important given that most energy efficiency investments take time to pay back and expected price rises will generally improve their economics. Small distributed generators and consumers in particular are less likely to be able to estimate these forward prices than larger market participants, and so operate at a disadvantage. Unless all market players have access to information about forward energy prices, it is unlikely that efficient decisions will be made.

Improve the focus on energy efficiency in the NEM

Option 7: Task the MCE to incorporate any national energy efficiency target into NEM governance arrangements.

Any change to the NEM governance arrangements should be done without altering or overriding the National Electricity Objective,[16] through either a statement of policy principles or new principles in the National Electricity Law. (See Appendix K for illustrative examples of how this might be achieved.)

Option 8: Require the AER to undertake a regular energy efficiency performance review of relevant NEM participants, which would allow for monitoring of improvements over time.

Consistent, reliable information is lacking on energy efficiency measures undertaken by businesses in the NEM (generators, networks and retailers) and any associated savings in energy, demand and cost. It is therefore not possible to compare the energy efficiency performance of different businesses in the NEM (particularly between network service providers).

Improved measurement, monitoring and reporting of energy efficiency performance, measures and their effectiveness within the NEM would help resolve this issue. This information could complement an energy efficiency measurement and analysis platform (see chapter 6).

Option 9: Task the AEMC to consider any supporting changes in the National Electricity Rules in the context of this package of options.

12.6 International precedents

The inclusion of energy efficiency considerations within the Californian energy market (and across California's economy more broadly) is widely cited as having major energy efficiency benefits. The Californian and Australian systems are very differently structured, and so require different regulatory approaches. However, it is expected that this package of measures, in combination with an energy savings initiative, would see substantial energy efficiency improvements within the Australian energy market.

Other countries are also seeing significant increases in distributed generation. For example, in China distributed generation can provide rapid energy solutions in dispersed, energy-constrained rural populations where network solutions would be much slower.

The UK network losses incentive scheme has achieved a 1.5 per cent reduction in network losses and provides a useful precedent for the proposed option 2.

12.7 Implementation

The Australian Government would need to amend the Energy Efficiency Opportunities Act to include generators and network service providers in the program (options 1 and 2).

The Prime Minister could request the MCE to consider incorporating any national energy efficiency target into NEM governance arrangements (without altering or overriding the National Electricity Objective) (option 7).

The MCE could also be requested to accelerate current work aimed at streamlining distributed generation connection and investigate whether the jurisdictional process of setting reliability standards is reducing the take-up of distributed

generation and demand-side participation, and, if so, options to deal with this barrier (option 5).

The AEMC could be tasked (through a request from the MCE) to:

- identify (in consultation with the AER, AEMO and relevant technical experts) the changes necessary to ensure networks implement identified cost-effective energy loss reduction activities (option 2)
- look at options to improve the ability of distributed generation proponents to resolve technical connection matters; implement changes proposed to network planning; identify opportunities for more transparent connection pricing; and consider options for a distributed generation ombudsman (option 5)
- investigate barriers to efficient price signals; barriers to tariffs that promote energy efficiency; options to encourage retailers to increase pass-through of price signals to consumers; and options to improve forward price transparency (option 6)
- work with the AER to strengthen arrangements for regulatory oversight on network investment tests, including consideration of the application of civil penalties (option 3)
- review the body of National Electricity Rules to ensure that they reflect the intent of the other changes being made (option 9).

The AER could be required (through a request from the MCE) to:

- undertake regular energy efficiency performance reporting, with the scope of this reporting agreed by the MCE (option 8)
- undertake a comprehensive evaluation of the Demand Management Incentive Scheme (option 4).

Improved energy efficiency in the Australian energy market should reduce energy demand and electricity peak demand, which in turn would reduce the need for new electricity infrastructure investment and the associated retail electricity costs.

12.8 Expected benefits and costs

Improved energy efficiency in the Australian energy market should reduce energy demand and electricity peak demand, which in turn would reduce the need for new electricity infrastructure investment and the associated retail electricity costs.

Implementation costs and complexities

Generators and network service providers would face implementation costs if they were included in the Energy Efficiency Opportunities program as per options 1 and 2. Network service providers would generally pass these costs through to energy end users, and generators would also be expected to pass through at least some of their costs. However, these costs would not be sufficient to make a material difference to individual energy bills. Any measures implemented as a result of the Energy Efficiency Opportunities assessment should give positive returns over two to four years.

NEM participants would face some additional reporting costs in relation to option 8 on improved measurement and reporting, but these are not expected to be significant, as the NEM bodies already hold most of the required data.

Many of the proposed options would need to be pursued through normal MCE channels, including standard consultation and assessment processes. Benefits, implementation costs and risks would be fully considered during the implementation stage.

Notes

1 Australian Bureau of Agricultural and Resource Economics (ABARE), *Energy in Australia*, 2010.

2 ABARE, *Australian energy statistics*, 2010.

3 ABARE, *Australian energy projections to 2029–30*, 2010.

4 Summary of determinations published by the Australian Energy Regulator, quoted by the Hon Martin Ferguson, AM, MP, 'Energy prices will keep rising', *The Australian*, 22 March 2010.

5 Australian Energy Regulator (AER), *State of the energy market*, 2009.

6 In some regions reported losses are focused on detected and undetected leaks rather than total losses, making comparisons difficult (AER, 2009).

7 Council of Australian Governments, Attachment B, *National competition policy review*, decision 2.2(c), meeting on 10 February 2006.

8 Referred to as either the Demand Management Incentive Scheme or the Demand Management Innovation Allowance, these schemes currently operate differently in each jurisdiction, but all have the effect of providing further incentives or opportunities for networks to undertake demand management trials within their regulatory allowances. The AER envisages a national scheme in the future, but allowed for different approaches as a transition to national arrangements.

9 With direct load control, utilities are able to control the timing of operation of appliances such as pool pumps or air conditioners, to spread the demand for electricity over the course of 24 hours.

10 ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010.

11 Australian Energy Market Operator, www.aemo.com.au/electricityops/lossfactors.html.

12 ClimateWorks, 2010.

13 An energy savings initiative may not resolve the split incentive, as linking measurable loss reduction to discrete activities is difficult. A system-wide management approach is necessary, against a baseline of energy throughput. This may be too complex to implement through a market measure (depending on the design of the measure) and may be better managed through regulatory incentives.

14 Work is occurring through the rule changes approved in response to the review of the National Framework for Electricity Distribution Network Planning and Expansion; and through the response to stage 2 and proposed stage 3 of the review of demand-side participation in the NEM.

15 An Electricity Statement of Opportunities report is prepared annually by the AEMO. The report provides forward projections of the supply–demand balance in order to identify the need for further generation or network capacity.

16 The National Electricity Objective is stated in the National Electricity Law. It guides the Australian Energy Market Commission and the Australian Energy Regulator in performing their functions.

The role of energy service companies

Energy service companies (ESCOs) provide a range of business models aimed at capturing the market's potential to respond to the demand for improved energy efficiency. A growing, innovative and dynamic ESCO sector could help enable a step change in energy efficiency in Australia.

The main challenges for the ESCO sector include:

- low awareness of and low demand for ESCO services in Australia, particularly of more innovative services such as energy performance contracting
- relatively high transaction costs and risks in energy performance contracting
- limited capacity and capability within the sector.

International experience in countries such as the United States and the United Kingdom has demonstrated that initial government support for measures aimed at improving energy efficiency in community facilities such as hospitals, aged care, schools and universities have successfully provided the basis for transforming the energy services sector from infancy into a thriving new green industry.

The approach suggested by the Task Group in this chapter could address a number of barriers impeding the development of the Australian ESCO sector, including a lack of information on energy solutions (particularly more complex or larger-scale solutions) and a lack of skills. The measures could also be used to showcase access and approaches to energy efficiency financing.

Energy service companies deliver energy efficiency improvement and related services — in the context of imroving Australia's level of energy efficiency, ESCOs are an enabling mechanism. These companies offer services such as advice, audits, business case assessment, design solutions, process optimisation, procurement and installation or commissioning of technologies and systems and, in some cases, asset management and innovative project financing.

There are a wide variety of definitions for ESCOs. In this report, they are defined as companies that can offer complete energy efficiency upgrades, including identifying options for efficiency projects, managing their installation and taking some level of responsibility for their performance. Although ESCOs may subcontract part of the upgrade process to parties such as electricians, plumbers and experts in heating, ventilation and air conditioning, they are able to 'take charge' of delivering energy efficiency upgrades for other companies.

Energy-using businesses and households rarely possess the expertise or know-how necessary to optimise their energy efficiency. By providing complete energy efficiency services, ESCOs can address the barriers that impede efficiency improvements in households, governments, commercial buildings and industry.

If Australia were to achieve a step-change improvement in energy efficiency, ESCOs would be likely to grow in both size and capability. At the same time, rapid and unmanaged growth could risk rising costs and poor quality of services, as new and less experienced players enter the market. The challenge is to ensure that high-quality capacity develops and grows as demand for ESCO services rises. Government initiatives to boost energy efficiency could also help drive ESCO development.

13.1 International precedents

ESCOs emerged in the United States in the 1970s and 1980s, where conditions such as relatively easy access to project finance, together with government support for demand-side management, encouraged the growth of specialised energy efficiency companies.

The key offering of ESCOs in the United States has been energy performance contracting, an innovative financing mechanism in which the ESCO finances — either using a 'third party' financer such as a bank or its own balance sheet — and installs (and sometimes manages) energy efficiency upgrades, typically to institutional buildings such as hospitals and schools (see Box 13.1). The ESCO and third-party financer are paid from the stream of energy cost savings that result from the investment over a defined period of time, typically five to seven years, but sometimes up to 10 years.

A recent study by the Lawrence Berkeley National Laboratory in the United States found that, between 1990 and 2006, ESCOs in the United States reported market activity of around US$28 billion, with about 75–80 per cent of that activity concentrated in the institutional markets (schools, universities, government and hospitals).[1] The study concluded that a key impediment to the further development of the ESCO market (in the state government sector) was the lack of consistent baseline data on the stock of buildings (on, for example, floor area, historic energy consumption and expenditure), and also that 'the ability of state governments to overcome policy and programmatic barriers to energy performance contracting implementation' was a factor affecting take-up rates.[2]

In Europe, a 2004 study noted a wide variation in the take-up of the ESCO model in different European Union countries. The key drivers for these differences were (1) different levels of support offered to ESCOs by national and regional energy authorities, (2) local market structures and rules, and (3) variation in the definitions, roles and activities of ESCOs.[3]

Box 13.1 ESCO development in the United States

ESCOs first emerged in the United States during the 1970s and 1980s in the wake of the global oil shocks. Rapidly rising energy costs, constrained capital budgets for government agencies in particular, and relatively easy access to innovative private finance, encouraged public institutions (and some companies) to shift energy costs off the balance sheet through a service known as 'energy performance contracting'. Under energy performance contracts, ESCOs identify energy savings opportunities, provide access to third-party financing for necessary capital expenditure, and often guarantee the energy savings to the client.

But the introduction of energy performance contracts in the United States was not all plain sailing. Energy performance contracts required (then and now) relatively long payback periods, often seven years or more. Few companies were willing to enter such long-term arrangements, while many public institutions faced barriers such as procurement policies that required them to choose the 'lowest cost' rather than the 'best value' service offer, or restrictions on writing contracts that stretched beyond their four-year budget horizon.

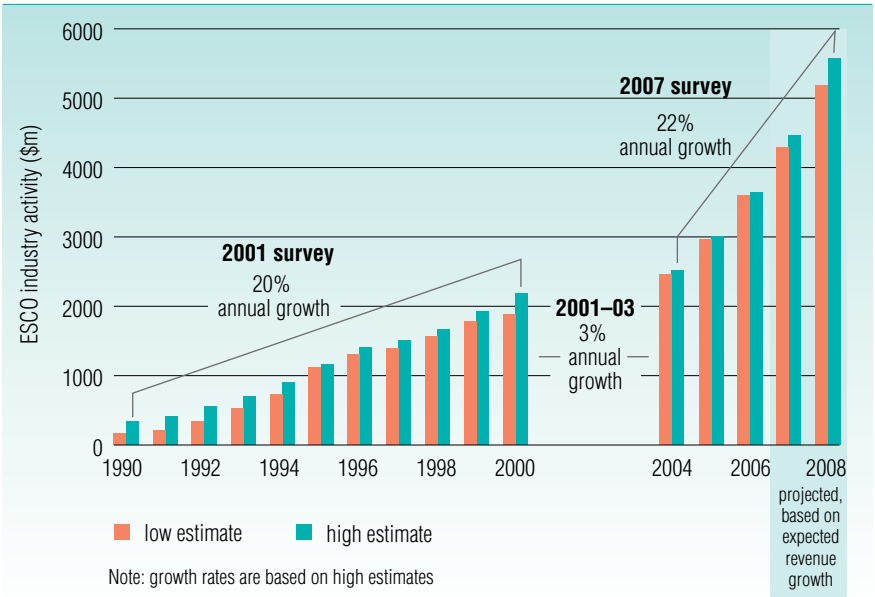
The ESCO sector only really took off in the United States from the early 1990s, when federal and state governments made a number of policy decisions (see Figure 13.1). The *Energy Policy Act 1992* enabled federal agencies to participate in energy performance contracts with terms of up to 25 years. Many states followed suit. The procurement policies and procedures of government institutions were modified to encourage the use of energy performance contracts, notably in the 'MUSH' sector (municipalities, universities, schools and hospitals), which, along with federal facilities, makes up 80 per cent of the ESCO market in the United States (see Figure 13.2). Finally, a range of levy-financed energy efficiency and demand-side management programs helped to further stimulate demand for ESCO services.

The low-growth years of 2001 to 2003 illustrated in Figure 13.1 demonstrate the importance of enabling legislation and policy. One of the contributing factors cited for this period of weak growth was the expiry and delayed replacement of enabling legislation, although other factors were also in play.

With new legislation in place, by 2006 ESCOs had enabled private investment in energy efficiency in the United States to reach the same level as the combined expenditure of all state and federal ratepayer-funded energy efficiency programs; that is, around US$2.5 billion.

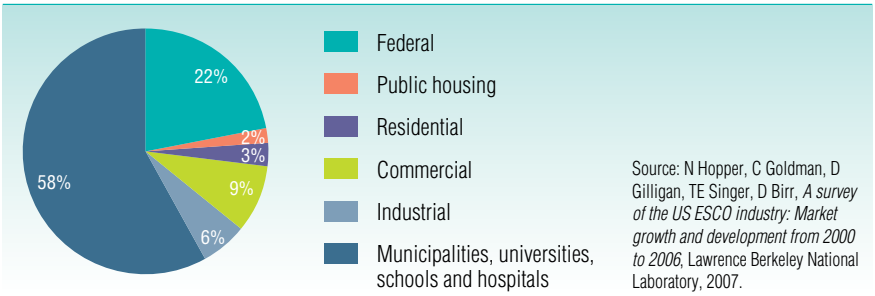
ESCOs enabled private investment in energy efficiency in the United States to reach the same level as the combined expenditure of all state and federal ratepayer-funded energy efficiency programs

Figure 13.1 ESCO market growth in the United States, 1990–2008



Source: N Hopper, C Goldman, D Gilligan, TE Singer, D Birr, *A survey of the US ESCO industry: Market growth and development from 2000 to 2006*, Lawrence Berkeley National Laboratory, 2007.

Figure 13.2 ESCO industry revenues by sector



Source: N Hopper, C Goldman, D Gilligan, TE Singer, D Birr, *A survey of the US ESCO industry: Market growth and development from 2000 to 2006*, Lawrence Berkeley National Laboratory, 2007.

13.2 The ESCO challenge

ESCOs provide a range of business models aimed at capturing the market's potential to respond to the demand for improved energy efficiency. A growing, innovative and dynamic ESCO sector could help enable a step change in energy efficiency in Australia. Conversely, if our ESCO sector remains small, Australia is unlikely to substantially improve its current low level of energy efficiency achievement. Managing energy efficiency requires a degree of expertise not normally found in households and small businesses, and even large energy users have tended to outsource energy management services to ESCOs.

> Using energy performance contracting, a third party accepts some of the technical risk of achieving energy savings on behalf of an energy user and provides the desired services in a more efficient way. ESCOs have more expertise and experience to accept greater risk and can therefore make a margin on the transaction.
>
> Booz & Company[4]

The main inter-related challenges for growing the ESCO market include:

- low awareness of, and low demand for, ESCO services in Australia, particularly the more innovative services such as energy performance contracting
- relatively high transaction costs and risks in energy performance contracting
- limited capacity and capability within the sector.

Low awareness

Energy performance contracting takes a variety of forms. In some cases, the quantum of energy savings is guaranteed by the ESCO ('guaranteed savings schemes'): once the investment is financed, the ongoing energy cost savings are retained by the energy user or building owner. In other cases, the financial savings are shared between the ESCO and the energy user ('shared savings schemes'), although such contracts typically have a longer term. At one end of the spectrum, energy service contracting merges into facilities management, where the ESCO retains ownership of and manages certain equipment within the host site, with the ESCO paid only for the service provided (electricity, heat, cooling or other energy services), not the equipment it installs.

For the most part, energy users in Australia are not familiar with the term 'ESCO', or with the innovative services ESCOs can offer, such as energy performance contracting. This is partly because of their relative novelty in the Australian market and limited numbers, as discussed further below.

Energy users in Australia are not familiar with the term 'ESCO', or with the innovative services ESCOs can offer, such as energy performance contracting. This is partly because of their relative novelty in the Australian market and limited numbers.

Transaction costs and risks

Energy performance contracting often involves complex risk transfers between technology or energy solution providers, financers and energy users, as well as transaction costs that may be higher than in conventional energy efficiency investments. In a conventional energy efficiency investment — for example, when a commercial building owner invests in a new lighting system — the building owner takes on the financial risks associated with the investment. If a financial institution is involved, it will generally secure a loan against physical property. The designers, providers and installers of the lighting system will have limited liabilities, such as warranties, beyond which the building owner will carry the technical and performance risks associated with the system over time.

Under an energy performance contract, by contrast, the technical and performance risks, and the majority of the financial risks, are transferred to the ESCO and/or third-party financer.

In Australia, project financing of energy efficiency improvements — in which a financial institution's loan security is limited to the assets and revenues associated with the project rather than the company's wider assets — is relatively unknown and difficult to negotiate in the current market setting.

Many opportunities are available to further develop the ESCO market in Australia. They include:

- the introduction of standard-form contracts and contract provisions
- focused education, training and accreditation of service providers by a reputable and trusted body
- raising awareness of energy performance contracting with the financial community and energy users.

Some of this work is already underway as part of the National Strategy on Energy Efficiency, including the development of a standard form contract.

Low demand

The current low level of demand for ESCO services such as energy performance contracting reflects the low levels of awareness of ESCOs and the relatively high transaction costs noted above. But other factors have also contributed to the constrained growth in demand for ESCO services. These include low energy prices, uncertainty in policy settings, the trend away from owner-occupied buildings and, recently, restricted access to capital associated with the global financial crisis.

Limited capacity and capability

The companies that provide energy services in Australia are highly diverse and are not necessarily known or advertised as 'energy service companies'. They may be single-person firms providing audit or advisory services; insulation, lighting or other technology- or solution-specific service providers; consultants; engineering firms; facilities managers; or divisions of consolidated groups.[5]

The lack of awareness of ESCOs and energy performance contracting means that many energy users may not have the skills to engage confidently with an ESCO. Lack of experience can increase transaction costs for energy users in engaging an ESCO, or prevent any engagement at all. For example, where organisations apply procurement processes that require separate tendering for the processes of identifying energy efficiency opportunities and implementing them, the ESCO model would not work.

Second, lack of experience can lead energy users to overestimate the risks and costs of a transaction, significantly reducing its attractiveness. Where companies lack the skills, confidence or understanding of ESCOs they are less likely to engage them.

Information asymmetries between ESCOs and potential clients can mean that clients find it hard to determine the quality of an ESCO before they engage it.

The potential for ESCOs to grow rapidly is limited by the small pool of engineers and tradespeople with appropriate skills and experience in energy efficiency. Energy efficiency is a specialised area and, in the case of industrial energy efficiency, processes are being re-engineered that someone else may have already attempted to optimise. Anecdotally, it appears to take at least two years of experience for an engineer to become a competent project manager in the area of energy efficiency.

Energy users need to use a range of auxiliary services to become competent consumers of energy efficiency services. Service providers may include facilitators who can manage an energy performance contract, or lawyers who can access the contracts and measurement and verification expertise that can confirm that energy savings are being delivered.

Information asymmetries between ESCOs and potential clients can mean that clients find it hard to determine the quality of an ESCO before they engage it. Unlike traditional engineering contractors with established expertise, facility managers have little experience of the capabilities of ESCOs and cannot rely on past experience to guide their selection and engagement with the ESCO industry.

Improving the understanding of the capabilities of ESCOs and introducing national accreditation arrangements for the sector could serve to protect energy users from purchasing poor-quality services, and establish and maintain the credibility of the ESCO industry.

Interest in the ESCO sector in Australia has grown recently. The Clinton Climate Initiative (in partnership with the Green Building Council in the United States) is actively promoting energy performance contracting through its Climate Positive Development Program in Australia and globally. The initiative supports the development of large-scale urban projects that will demonstrate that cities can grow in ways that are 'climate positive'; that is, with on-site CO_2 emissions that are below zero, generally through the export of surplus renewable energy. Program deliverables include technical support, business and financial analysis, and partnership facilitation for commercial building retrofits, using an energy performance contracting model.

13.3 Existing measures

The Australian Carbon Trust, announced in May 2009 by the Australian Government, has been established as an independent company to provide seed funding to demonstrate innovative funding models and projects in existing commercial buildings and other business operations. The Trust was established to provide awareness-raising, advice and innovative finance solutions to businesses, the public sector and households on implementing cost-effective energy efficiency measures in Australia. The Trust also seeks to increase capacity in the private sector, including ESCOs.

The National Strategy on Energy Efficiency, in measure 1.2.1, provides for a National Energy Efficiency Skills Initiative, which is under development. The initiative aims, among other things, to develop national accreditation processes for ESCOs and related vocational education and training modules.

At the state level, Melbourne and Sydney are both collaborating with the Clinton Climate Initiative and the global 'C40' (40 cities) initiative to promote large-scale refurbishment of CBD buildings using energy performance contracting as a driver for change.

One approach to drive the development of the ESCO sector would be to establish a revolving financing mechanism to support energy efficiency improvements across community facilities.

13.4 Options

Based on international experience in both the United States and the United Kingdom, the Australian Government could consider an approach that targets large energy efficiency savings in the buildings sector while concurrently supporting the growth of an innovative and healthy ESCO sector (see chapter 10).

The approach suggested by the Task Group could address a number of barriers that impede the development of the ESCO market, including a lack of information on energy solutions (particularly more complex or larger-scale solutions) and a lack of skills in the ESCO sector. The measures could also be used to showcase access and approaches to energy efficiency financing.

Community facilities

One approach to drive the development of the ESCO sector would be to establish a revolving financing mechanism to support energy efficiency improvements across community facilities. Such a mechanism could provide for high-priority energy efficiency upgrades in public buildings and community centres, as well as help demonstrate the cost-effectiveness of technologies such as cogeneration. Internationally this model has been very successful and recent Australian reports, including the ClimateWorks Australia report, suggest that large savings opportunities exist in education, health and community buildings, in part because they have received little attention to date.[6]

Improving the energy efficiency of government buildings

The Australian Government could consider revising the existing voluntary government energy-saving goals. One way that this could be achieved would be to decrease the current tenant light and power from 7,500 MJ/person/annum to 5,000 MJ/person/annum, while also altering the target for central services from the current 400 MJ/m2/annum to 350 MJ/m2/annum.[7] This approach would equate to achieving NABERS energy ratings of around 4.5 stars for tenant light and power and nearly 5 stars for central services.To assist government agencies to achieve new, tougher energy efficiency targets, a financing mechanism could

be established to provide support for the necessary building improvements. This measure would also assist in stimulating a market for ESCOs in Australia. As noted above (Box 13.1), institutional buildings constitute around 80 per cent of the ESCO market in the United States.

ESCO quality assurance

Should the Government decide to pursue approaches such as those outlined above and encourage other levels of government to do likewise, this would kick-start the development of ESCOs in Australia. An important additional measure would be to facilitate the orderly growth of the ESCO sector by encouraging the highest standards of performance, reducing transaction costs and risks to the extent possible, and winning and retaining public confidence. To this end the Australian Government could work with relevant industry associations, education and training service providers and other stakeholders to develop and promote an ESCO accreditation and training regime.

The proposal would build on and complement existing industry arrangements:

- the Green Skills Agreement and National Strategy on Energy Efficiency measure 1.2.1 (the proposed National Energy Efficiency Skills Initiative) to assist in the development of standard form contracts and contract provisions, and appropriate education and training modules
- professional accreditation services
- a performance auditing and monitoring regime.

As part of this process, the Government could work with industry to engage with a wide range of stakeholders in the financial community and buildings and industrial sectors, as well as equipment providers and other stakeholders, to ensure that the elements of a quality assurance regime are comprehensive and fit for purpose.

13.5 Expected outcomes

The combined effect of the proposals outlined above could stimulate the demand for energy services in Australia while ensuring appropriate quantity and quality of service provision. This could provide Australian energy users with access to world-class energy efficiency solutions that are affordable and reliable.

13.6 Implementation

The Australian Carbon Trust could administer activities to improve the energy efficiency of community facilities as a complement to its existing work program.

Enhanced targets for government buildings and a financing mechanism to support upgrades to government buildings could be managed within the existing arrangements for energy efficiency in government operations.

An ESCO training and accreditation regime could be developed in tandem with the National Energy Efficiency Skills Initiative and in close consultation with industry groups such as the Energy Efficiency Council, which is already working on elements of such a program.

Should the Government wish to proceed on the proposals outlined above, further cost–benefit analysis, as well as investigation of the most appropriate funding models, would be required.

Notes

1 R Bharvirkar, C Goldman, D Gilligan, T Singer, D Birr, P Donahue & S Serota, *Performance contracting and energy efficiency in the state government market*, Lawrence Berkeley National Laboratory, research paper 1202E, 2008.

2 Bharvirkar et al., p. 32.

3 V Berrutto, P Bertoldi, E Vine, S Rezessy, J Adnot & A Iqbal, *Developing an ESCO industry in the European Union*, 2004.

4 Email communication from Booz & Company to the Task Group.

5 Originally founded in 1855 as a sugar company, CSR is one of Australia's oldest companies. See www.csr.com.au, accessed 7 July 2010.

6 ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010.

7 Advice from DCCEE, Building & Government Energy Efficiency Branch.

Energy efficiency standards, ratings and labels

Well-targeted standards and labelling have a proven track record in unlocking emissions reductions and energy savings potential. The current approach to standards, ratings and labels in the equipment and appliance sectors in Australia is projected to return net benefits of $22.44 billion from 2009 to 2024 and save the community $5.2 billion in the year 2020 alone. Australia has a strong reputation internationally for its existing approach to appliance and equipment minimum energy performance standards.

Standards have an important role in efforts to achieve a step change in energy efficiency. Developing and maintaining standards that can keep pace with the marketplace is becoming both more difficult and more important. Accordingly, there is an opportunity to improve our existing approach.

Measures to improve energy efficiency performance and labelling in Australia are underway as a part of the National Strategy on Energy Efficiency. This includes the development of national legislation.

The Task Group's proposals would build on this by

- seeking to accelerate the process for setting minimum energy performance standards for products
- expanding the range of products to include non-energy-using products that impact on the energy efficiency of energy-using products during operation
- encouraging innovation and competition for high-efficiency products.

Minimum energy performance standards (widely known as MEPS) have been used in Australia — and around the world — for more than two decades to remove inefficient energy-using products from the market, and prevent the construction of inefficient buildings.

In Australia this occurs only where it can be shown that the benefits of doing so clearly outweigh the costs and that market competition would not be damaged. While removing the least efficient products from the market automatically skews the remaining market towards a more energy-efficient product mix,[1] MEPS on their own (at least as used in Australia — see below) have focused on 'lifting the floor' (the minimum acceptable level of energy efficiency) rather than 'lifting the ceiling' (actively encouraging best practice efficiency levels).

In other economies — notably Japan and the United States — high energy performance standards have been used more aggressively to promote the most efficient products in the marketplace.

In other economies — notably Japan and the United States (in particular in California) — high energy performance standards have been used more aggressively to promote the most efficient products in the marketplace (in Japan, the best-in-class product is named as the 'top runner' and the average efficiency of the rest of the market is required to catch up with this performance level within a defined period, typically three years). In California, MEPS have also been used to actively force a 'market transformation'. For example, in 1990 a MEPS level was announced that would apply to refrigerators after three years. At the time the standard was announced, no refrigerator on the US market was capable of the minimum performance level required by 1993.

As in many other countries, MEPS in Australia are used in combination with comparative energy efficiency labels and ratings. Ratings and labels are generally structured so that 'one star' is equal to the minimum standard, while higher star ratings equate to progressively more energy-efficient products. The primary purpose of labels and ratings is to remedy the lack of information on the energy performance of appliances, equipment, buildings and products that may result in poor energy efficiency choices. For example, in the absence of labelling and ratings, it would be very difficult for purchasers to distinguish an energy-efficient washing machine or building from an energy-inefficient one — outwardly they can look the same.

Comparative energy labels and ratings also have an important secondary purpose: they act as a focus for competition between manufacturers on the basis of the energy efficiency of their products. In the past, government support for the annual 'Galaxy Awards' (discontinued in 2001) for the most energy-efficient appliances in a range of classes provided an important focus for such competition, as well as reward and recognition for the manufacturers.

Australia currently has a mix of standards and labels in a range of product and equipment classes.[2]

Well-targeted standards and labelling have a proven track record in unlocking emissions reductions and energy savings potential.[3] For example, energy labelling and minimum standards under the Australian Equipment Energy Efficiency program are projected to return net benefits of $22.44 billion from 2009 to 2024 and save the community $5.2 billion in the year 2020 alone.[4]

14.1 The energy efficiency standards challenge

Garnaut noted that disclosure of energy efficiency information is important in addressing bounded rationality and information barriers, including the materiality of information, and that there are substantial information asymmetries between manufactures/retailers and customers for appliances, vehicles and houses. He stated, 'Mandatory disclosure should apply to goods where it is cost-effective to do so'.[5]

The challenge is to extend energy efficiency performance standards and associated labelling to a wider range of products where it is clear that these barriers exist and it would provide a benefit to consumers.

14.2 Existing measures

Current Australian measures to develop energy efficiency standards, ratings and labels include:

- *Appliances and equipment:* The Equipment Energy Efficiency (E3) program, which includes MEPS and labelling, covers the technical, legal and administrative aspects of national appliance and equipment energy efficiency initiatives, in particular mandatory minimum standards and energy efficiency labelling. The program began with five products, but now applies MEPS to 17 product groups and mandatory energy rating labels to seven products, covering nearly 32,000 registered models. Another four products are being investigated for their suitability for inclusion in the program.[6]
- *Residential buildings:* In 2006, the minimum energy efficiency standard for houses in the Building Code of Australia was increased to five stars. In 2009, COAG agreed to increase the standard for all housing to six stars, and include standards for hot water and lighting, by May 2011. In July 2009, COAG committed — subject to regulatory impact assessment requirements — to phase in by May 2011 mandatory disclosure of residential building energy, greenhouse gas and water performance at the time of sale or lease, commencing with energy efficiency.
- *Commercial buildings:* The energy efficiency requirements in the Building Code of Australia for all new commercial buildings will be higher from 2010. The new provisions will seek to minimise energy use through improvements to the building fabric, glazing, artificial lighting, and heating, ventilation and air-conditioning systems in new commercial buildings from 2010.

A new national system for the mandatory disclosure of commercial building energy efficiency will be implemented in 2010, beginning with large office buildings. The scheme will require office buildings with areas of 2,000 square metres or larger to disclose to prospective buyers or tenants a base building star rating and associated energy efficiency information at the point of sale, lease or sublease.

A new national building energy standard-setting, assessment and rating framework is being developed for implementation in 2011. As part of this initiative, the NABERS suite of rating tools for commercial buildings will be enhanced through a more effective national governance framework. Building energy efficiency is covered in detail in chapter 10.

The E3 program is operated through cooperative action by state and territory governments and the New Zealand Government. This allows both countries to honour their commitments under the Trans-Tasman Mutual Recognition Arrangement.

The rapid expansion in the program in response to policies to reduce greenhouse gas emissions has highlighted problems with the program in its current form. The problems relate to:

- inconsistencies and inefficiencies in the administration of the program
- the monitoring of program impacts
- the scope of the program and appropriate targeting of products and efficiencies
- the risk of unintended environmental problems, which the program has no direct capacity to address.

Inconsistencies in process and application add considerable complexity and cost to the administration of the program relative to a single national approach. They also raise compliance costs for businesses and have the potential to create added uncertainty and risk. Inefficiencies can increase costs and reduce benefits to the economy by delaying the introduction of available higher-performing products. If standard-setting procedures do not properly account for the potential for technological development, the program runs the risk of being suboptimal.[7]

The E3 program's effectiveness is limited by the fact that the current regulatory framework does not provide for coverage of products using energy forms other than electricity or non-energy-using products, even though such products impact on energy efficiency and greenhouse gas emissions.[8] Emerging information technologies that facilitate the integration of energy-using products into 'smart grids' could also provide opportunities for system-wide energy efficiency management and may need increased recognition within standard-setting processes.[9]

The National Strategy on Energy Efficiency contains a measure to establish national legislation for MEPS and labelling, and over time add greenhouse and energy minimum standards (GEMS). The process for the development of national legislation is well underway and offers the opportunity to streamline the development of standards and expand the range and type of energy ratings and labels in Australia.

Measures to improve energy efficiency performance and labelling in Australia are underway. However, more could be done to accelerate the process.

In summary, measures to improve energy efficiency performance and labelling in Australia are underway as a part of the National Strategy on Energy Efficiency. However, more could be done to accelerate the process for setting MEPS for products; expand the range of products to include non-energy-using products that impact on the energy efficiency of energy-using products during operation; and encourage innovation and competition for high-efficiency products.

Box 14.1 Energy efficiency of computers in Australia — a case study

Computer equipment ownership is still growing in Australia, on top of an estimated stock of more than 20 million computers already in homes and workplaces across the country. As a result, the level of energy consumption of computers and associated monitors is becoming more important to the economy as a whole. Current estimates are that computers already consume more energy than some other classes of regulated appliances, such as clothes washing machines and dishwashers.[10]

In 2008, the Department of the Environment, Water, Heritage and the Arts commissioned testing of desktop and notebook personal computers, bought on the open market, as part of the E3 program to understand the energy use and energy efficiency of appliances and equipment sold in Australia. This preliminary study found that:

> When purchasing computers for testing, the testing agents reported that they found it difficult to identify equipment that meets either of the Energy Star benchmarks. Thus even if a consumer wished to purchase a more efficient computer, being able to identify more efficient equipment is difficult because of the lack of reliable information available in the marketplace.[11]

14.3 Options to improve energy efficiency standards, ratings and labelling

High energy performance standards and an endorsement label

A limitation of minimum standards as applied in Australia is that they do not on their own drive innovation because there is no incentive to go beyond the minimum.

To build on and extend existing arrangements, high energy performance standards, or HEPS, could be developed — in addition to the minimum level, or MEPS.

High energy performance standards could provide a clear focus for innovation and competition between manufacturers by identifying the best-performing product,

or narrow band of products, within a category. The product or products concerned would have to be able to be clearly delineated as the highest performing at a point in time. The HEPS would set a clear timeframe (appropriate for the particular product) for this to become the minimum level. This would provide a mechanism for not only lifting minimum standards (the 'floor') but also seeking to raise the 'ceiling'. Additionally, HEPS can provide the basis for an 'endorsement' label that rewards the product or narrow band of products that achieve the HEPS by helping consumers (and purchasing officers within businesses) readily identify the most efficient product or products in a class.

This measure could serve to minimise the level of risk or uncertainty faced by individuals, businesses or governments, without restricting freedom of choice.

To obtain a HEPS rating, products would be required to be the most energy efficient (within a narrow band) on the Australian market. A HEPS would:

- encourage competition and reward manufacturers and retailers of highly efficient products
- give assurance to consumers that they are purchasing the most efficient product available
- encourage innovation
- facilitate procurement policies that support 'best of breed' products.

Endorsement labels differ from comparative energy efficiency labels by essentially acting as a 'brand' that stands for high efficiency, rather than presenting the purchaser with specific point-of-sale information. As with any good brand, the essence of an endorsement label is credibility — the credibility of the endorsement process and of the endorser.

Box 14.2 The Energy Saving Recommended scheme

The Energy Saving Recommended scheme was launched in 2000 by the UK Energy Saving Trust to identify the most energy-efficient products on the market. The scheme has been developed as an easy and instantly recognisable way for consumers to identify energy-saving products through a certification mark registered with the UK Intellectual Property Office.

Where product groups can be differentiated by their energy-saving characteristics, the scheme aims to endorse the top 20 per cent of products on the basis of their energy performance.

To gain certification a product must meet a set of strict criteria. These are developed with the involvement of a wide range of stakeholders, and are reviewed annually to ensure the scheme continues to drive market improvements in energy performance.

Endorsement labelling of high-performing products can be an important second tier of consumer information, adding value to first-tier comparative efficiency labels. For example, if organisations have a procurement policy requiring officers to source the most efficient products, then all they need do is look for the endorsement label. The work of gathering and comparing information across all available models is done for them.

High energy performance standards would have to be able to recognise, monitor and credit advances in energy efficiency as they occur, and offer time-limited accreditation. Failure to update the standards to genuinely reflect best practice as it evolves over time would penalise first movers and lead to a loss of credibility with the program.

> In terms of encouraging investment in new technology, performance standards that are updated regularly can be expected to stimulate innovation and the introduction of new more efficient products, especially when combined with appliance labelling and building certification.[12]

High energy performance standards could provide a focus for endorsement labelling in Australia; however, clearly any such labelling would need to be carefully developed in conjunction with the current star ratings labelling scheme, and in consultation with a range of stakeholders.

Australia recently joined the International Partnership for Energy Efficiency Cooperation where an initiative of the US Department of Energy, the Super-efficient Equipment and Appliance Deployment Program, is under development. The program aims to accelerate global development and deployment of highly efficient products and technologies. Aggregating global consumer demand for super-efficient products would enable manufacturers to accelerate investment in development and production of these products. The Australian Government has been approached to participate in this program. Such an international approach could align with a national approach.

…performance standards that are updated regularly can be expected to stimulate innovation and the introduction of new more efficient products…

Streamlining the energy efficiency standards process

Developing and maintaining standards that can keep pace with the marketplace is becoming both more difficult and more important. For example, new large-screen plasma television technologies, which use substantially more energy than their old technology counterparts,[13] were widespread long before labelling standards were in place to help consumers understand their increased energy use — and this trend is likely to continue. A 2006 article in Bloomberg Businessweek states that:

> The pace is picking up across such industries as retailing, consumer goods, software, electronics, autos, and medical devices. In many realms, the time it takes to bring a product to market has been cut in half during the past three or four years.[14]

In Australia, governments have sought to introduce MEPS for gas hot-water heaters since the late 1990s. In 1998, under the National Greenhouse Strategy, the Government undertook to work with industry to improve gas appliance efficiency. Agreement was reached to introduce MEPS (including the level of the MEPS) for gas hot-water heaters in 2004.[15] Despite this, a standard test method is yet to be put in place. The gas industry has operated a voluntary labelling system, but the labels are not mandatory, which can lead to 'free riders', and enforcement of a standard by government is not a legal option.

Clearly, then, an important outcome from the current national legislative development process would be to ensure the streamlining of the process and time taken to put standards in place. This could be further enhanced by enabling the fast adoption of relevant standards developed overseas.

Taking a systems approach to energy efficiency

A leading-edge approach to energy efficiency looks at the energy efficiency of energy-using and non-energy-using products when installed and operated as a system. Where energy-using products are part of a wider system, their efficiency can be optimised when the operation of the whole system is taken into account. There is evidence that the energy efficiency dividend could be substantial if such an approach was adopted.[16]

In its *Report to Congress on server and data center energy efficiency*, the US Environmental Protection Agency highlighted the value of a systems approach:

> While the trends discussed … can help to maximize the efficiency of individual data center components, even greater energy-efficiency gains may be realized by optimizing the operation and efficiency of the data center as a holistic system (e.g., through real-time, facility-level energy monitoring and management systems).[17]

Another example of the potential efficiencies of a systems approach is contained in an Australian Government report on residential energy use, which stated that:

> A review of data from the USA … found that heat gains (during the cooling cycle) or losses (during heating) due to conduction and air leaks in ductwork could increase the load on the air conditioner by up to 40 per cent [citation omitted]. If so, halving duct losses through energy labelling or MEPS for ducts could reduce operating energy by up to 20 per cent. This is equivalent to increasing the efficiency of the air conditioner itself by the same margin — and possibly much cheaper to achieve.[18]

While large companies can and do develop complex tools to model the efficiency of their systems and process, it is not cost-effective for small to medium enterprises, such as builders, plumbing and electrical contractors and associated trades, to develop these tools. Governments have provided advice on energy efficiency to builders to improve the energy efficiency of homes. Understanding the impact on overall energy efficiency of choosing non-energy-using products such as windows, ducting and pipe work would provide practical advice to tradespeople and the 'do it yourself' (DIY) community to optimise energy efficiency. In order to capture the full value of improving the energy efficiency of a range of appliances, equipment and buildings, a priority could be to develop models that simulate the operation of equipment within a system, and vary the energy-using and non-energy-using products and/or design to maximise the efficiency of the total system.

This would require the development of standards to ensure that the energy efficiency of multiple and complex systems could be facilitated at the design and installation stage, as well as the individual impact on a system of non-energy-using products. Mandatory disclosure of the energy performance of energy-using and non-energy-using products would provide designers of systems with some of the base data on individual components which could be aggregated to model the overall efficiency of a system.

Providing government-endorsed information on the value and concept of taking a systems approach to energy efficiency could be considered an extension of current best practice.

Addressing barriers

In order to address the barriers associated with lack of information, lack of skills and bounded rationality, the Task Group suggests the following options for standards:

- The current GEMS legislative development process could be enhanced by considering:
  - streamlining the development of MEPS, including the adoption of overseas standards where appropriate
  - further accelerating the development of MEPS for a wider range of existing and emerging products
  - developing standards for priority systems
  - introducing standards (HEPS) to encourage highly efficient products
  - expanding the coverage of MEPS to priority non-energy-using products that impact on the energy efficiency of energy-using products when in operation.
- Based on standards to encourage highly efficient products, government could consider developing an endorsement label to reward manufacturers of HEPS products and allow consumers to more easily identify the most energy-efficient products in Australia.

- To support the development of HEPS, government could consider mandating, for their own operations, the procurement of HEPS-rated equipment where it is available in the marketplace and is assessed as value for money.
- As part of the GEMS legislative process, government could consider the introduction of mandatory disclosure of the energy efficiency labelling of a range of products and services in advertising and promotional material.

14.4 International precedents

Energy efficiency standards and labelling are found in a variety of forms in many countries, including Canada, China, Chile, Japan, Korea, Mexico, Malaysia, New Zealand and Thailand.

The United States claims that energy efficiency measures adopted up to 2004 would result in US$130 billion (A$155 billion) cumulative present value dollar savings from reduced use of the lifetime of the products after subtraction of the additional cost for more efficient equipment. The $2 per household federal expenditure for implementing the US standards is estimated to have induced investment in energy-saving features equalling US$1,000 per household, which equates to US$2,170 gross savings per household in energy costs.[19]

Energy Star has been a joint US Environmental Protection Agency – Department of Energy program since 1996. Today more than 1,400 manufacturers use Energy Star labelling in over 40 product categories. Energy Star products are required to be more efficient than the MEPS requirement. The quantum of efficiency improvement varies; however, an Energy Star–labelled refrigerator needs to be 20 per cent more efficient than a non-Energy Star–labelled refrigerator.[20] Hotels that have earned the Energy Star accreditation perform in the top 25 per cent of hotels nationwide, use at least 35 per cent less energy and emit at least 35 per cent less greenhouse gas emissions than their peers.

The US Environmental Protection Agency has announced the development of a 'Super Star' program that would recognise the top 5 per cent of products in any given category.

A HEPS-type program is in place in the United Kingdom administered by the Energy Savings Trust.

14.5 Implementation and expected benefits

A limited HEPS program and associated compliance and enforcement function could commence within 12 months of a decision being made to proceed, and be fully developed within two years. Reforming the standards process could be undertaken within two years. Developing tools to facilitate system-wide analysis would need further work to accurately specify a timeframe.

An approach of this type would require legislative change.

The options outlined in this chapter are enabling measures, and as such no direct estimates of energy saving or emissions reductions have been made. Enabling measures facilitate energy savings or emissions reductions made through other programs, or by households or businesses independently of additional policy action.

Improvements to the energy efficiency of appliances, equipment and building would be supported only where they generate a net positive economic return.

Notes

1 N Stern, *The economics of climate change: The Stern Review*, Cambridge University Press, Cambridge, 2007, p. 433.

2 Information on current labels and standards for appliances and equipment in Australia can be found at www.energyrating.gov.au. Building standards can be found at www.abcb.gov.au.

3 ClimateWorks Australia, *A low carbon growth plan for Australia*, 2010.

4 George Wilkenfield & Associates, *Prevention is cheaper than cure: Avoiding carbon emissions through energy efficiency: Projected impacts of the Equipment Energy Efficiency program to 2020*, January 2009, www.energyrating.gov.au, p. 5.

5 R Garnaut, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008, p. 412.

6 George Wilkenfeld & Associates, *Consultation regulation impact statement: National legislation for appliance and equipment minimum energy performance standards (MEPS) and energy labelling*, prepared for the Department of the Environment, Water, Heritage and the Arts, 2010.

7 J Nordqvist, *Evaluation of Japan's Top Runner Program,* www.aid-ee.org/documents/018TopRunner-Japan.PDF, p. 29.

8 George Wilkenfeld & Associates, 2010.

9 GE brings smart grids to life as appliances gain support, http://arstechnica.com/business/news/2009/07/ge-cuts-a-deal-to-ready-its-appliances-for-the-smart-grid.ars, accessed 8 July 2010.

10 Department of the Environment, Water, Heritage and the Arts (DEWHA), *Computers and energy efficiency in Australia: A report on testing of 56 randomly selected computers,* 2009

11 DEWHA, 2009.

12 PricewaterhouseCoopers, *Review of energy efficiency policy options for the residential and commercial building sectors*, 2008.

13 Digital CEnergy, *Discussion paper: Television energy rating labels: The case, and proposal, for MEPS and labelling televisions,* www.energyrating.gov.au/library/pubs/200710-tv-meps-labelling.pdf, p. 35, figure 18.

14 *Speed demons: How smart companies are creating new products and whole new businesses almost overnight*, Bloomberg Businessweek, 27 March 2006.

15 DEWHA, *Switch on gas: Australia's strategy to improve the energy efficiency of gas appliances and equipment, 2005–2015*, December 2004.

16 US Environmental Protection Agency (US EPA), *Report to Congress on server and data centre energy efficiency*, 2007.

17 US EPA, 2007.

18 DEWHA, *Energy use in the Australian residential sector 1986–2020*, 2008.

19 S Meyers, J McMahon & M McNeil, *Realized and prospective impacts of us energy efficiency standards for residential appliances: 2004 update,* Lawrence Berkeley National Laboratory, University of California at Berkeley, 2005.

20 Energy Star website, www.energystar.gov, accessed 7 June 2010.

Ensuring the right skills are available

A skilled workforce is essential for achieving the energy efficiency improvements discussed throughout this report.

The Task Group has examined the two key streams of work currently underway to identify skills gaps and address skill requirements associated with energy efficiency — the Green Skills Agreement and the National Strategy on Energy Efficiency.

The Task Group considers that the implementation of current and planned measures will adequately support and equip the energy efficiency sector with the skills required for the transition to a low-carbon economy.

Proposals relating to skills development that are specific to building energy assessors are in chapter 10 and to the energy services sector are in chapter 13.

The transition to the low-carbon economy of the future will create new opportunities for enhancing existing skills. New trades and professions will need to develop. In this context, the availability of the right training options at the right time is necessary for Australian businesses and the workforce to prosper and grow.

The Task Group has examined work programs currently underway to identify skills gaps and address skills requirements. It considers that there are adequate measures in place to support and equip the energy efficiency sector with the skills needed for the transition to the low-carbon economy. That said, there are immediate issues to be resolved relating to accreditation for the emerging energy services sector and building energy assessors. The measures proposed to address these issues are discussed in chapters 10 and 13.

Two COAG mechanisms specifically address skills requirements in energy efficiency: the Green Skills Agreement and the National Strategy on Energy Efficiency.

The Green Skills Agreement sets out the strategic framework for building the capacity of the vocational education and training and higher education sectors.

15.1 The Green Skills Agreement

The Green Skills Agreement sets out the strategic framework for building the capacity of the vocational education and training and higher education sectors to meet the needs of Australian businesses in the transition to a low-carbon economy.[1]

In the agreement, skills for sustainability, also known as green skills (including skills required for the growth of the energy efficiency sector), are defined as the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community.

The agreement has four primary objectives:

- develop national standards in skills for sustainability within the requirements of the National Skills Framework (the Australian Quality Training Framework, the Australian Qualifications Framework and National Training Packages)
- improve the skills of vocational education and training practitioners so they can provide effective training and facilitation in skills for sustainability
- review and revise training packages to incorporate skills for sustainability
- implement strategies to re-skill vulnerable workers in the transition to a low-carbon economy.

Work is underway to achieve progress towards each of these objectives. The 11 Industry Skills Councils have been engaged to identify and address gaps in skills for sustainability in all relevant training packages. The revisions will be substantially complete by December 2010. In addition, research is underway to identify the skills development needs of the vocational education and training workforce and to also determine individuals and communities that may be vulnerable through the transition to a low-carbon economy.

The Green Skills Agreement Implementation Group, which comprises major stakeholders, will guide further actions to achieve the agreement's objectives under an implementation plan presented to the Ministerial Council on Tertiary Education and Employment in June 2010.

15.2 National Strategy on Energy Efficiency

The National Strategy on Energy Efficiency includes two specific skills and training measures.[2]

The first measure entails the development of the National Energy Efficiency Skills Initiative for approval and implementation in 2010–11 as a comprehensive strategy to provide for the future skills requirements of a low-carbon economy and the implementation of sustainability strategies. It will:

- identify energy efficiency skills requirements across the economy and associated training, accreditation and higher education needs
- identify relevant and emerging professions and trades and associated skills and training gaps
- work with industry and educational institutions to develop training courses and materials to address gaps, including the integration of accreditation schemes and qualifications into existing licensing regimes where appropriate
- develop accreditation standards and systems to support the value of energy efficiency training and provide consumers with confidence in accessing energy efficiency services
- publicise training and accreditation developments to encourage the market for energy efficiency services, encourage training, and provide customer awareness and protection.

The second measure focuses on strengthening national capability in energy auditing and assessment by:

- developing a long-term training strategy for energy efficiency assessment skills
- assessing the scope to rationalise energy efficiency audit and assessment processes
- undertaking a review of the energy audit standards (AS/NZ 3598:2000). Phase 1 of this project is scheduled to begin in 2010.

The National Strategy also includes measures for industry and business that will support skills development on the job by addressing information barriers for industry. This includes, for example, providing information to businesses on systems optimisation and new industrial technologies, such as in the motor and steam systems sectors.

These measures — which are predominantly implemented through the Long Term Strategy for Energy Efficiency Assessment Skills (currently being developed) — provide opportunities for making a more immediate impact on the energy efficiency capability of the existing workforce.

15.3 Research measures

A range of research measures are also underway across government including the Skills for the Carbon Challenge initiative, which will ensure that the higher education sector is well positioned to provide sustainability skills, knowledge and competencies to students. In other research:

- The Department of Education, Employment and Workplace Relations has commissioned the Australian Research Institute on Education for Sustainability at Macquarie University to develop a full teaching unit on energy efficiency and renewable energy that can be inserted at the diploma or graduate diploma level across higher education or vocational education and training curriculums.
- The Department of Innovation, Industry, Science and Research has commissioned a study that will analyse the skills needs of a low-carbon economy over the next 15 years.

15.4 Jurisdictional measures

In addition to the skills development being undertaken by COAG, individual jurisdictions are also working to progress skills development, including the development of courses in energy efficiency.

After examining the measures in progress under the two COAG mechanisms — the National Strategy on Energy Efficiency and the Green Skills Agreement — as well as current research commitments, the Task Group considers that current and planned policy treatments provide for the development of a comprehensive skills framework, noting the options specific to the energy services sector in chapter 13 and building energy assessors in chapter 10.

15.5 Improving communication

In light of the feedback received through consultations, the Task Group considers there is scope to improve communication avenues on the availability of energy efficiency skills and training. It has referred this issue to the responsible Australian Government agencies.

Notes

1 See www.deewr.gov.au/Skills/Programs/WorkDevelop/ClimateChangeSustainability/Pages/GreenSkillsAgreement.aspx.

2 See www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/Energy_efficiency_measures_table.pdf.

APPENDICES

APPENDIX A Terms of reference

1 The Prime Minister's Task Group on Energy Efficiency ('the Task Group') will report to the Minister for Climate Change, Water and Energy Efficiency and the Minister for Resources and Energy on options for introducing mechanisms to deliver a step-change improvement in Australia's energy efficiency by 2020 and place Australia at the forefront of OECD energy efficiency improvement.

2 Energy efficiency mechanisms recommended by the Task Group will:

- 2.1 be economically and environmentally effective, and socially inclusive;
- 2.2 complement the Carbon Pollution Reduction Scheme (CPRS) and the Renewable Energy Target (RET), in line with the Council of Australian Governments' Complementarity Principles (Attachment B);
- 2.3 build on, complement, inform and improve the National Strategy for Energy Efficiency (NSEE), and not duplicate its efforts;
- 2.4 be capable of delivering measureable and costed energy efficiency savings in the context of Australia's 2020 emissions reduction target and beyond;
- 2.5 support the deployment of a broad spectrum of technologies;
- 2.6 be capable of delivering energy efficiency improvements across all sectors, including commercial, industrial, government and residential, covering both stationary energy use and transport; and
- 2.7 target known barriers to energy efficiency improvements, including (but not limited to):
  - a information asymmetries;
  - b split incentives;
  - c access to capital;
  - d technology risks;
  - e regulatory barriers;
  - f energy pricing; and
  - g behavioural.

3 The Task Group will also consider options for using energy efficiency mechanisms to promote embedded and distributed generation.

4 The Task Group will consider and advise upon implementation arrangements for individual measures.

5 In making its recommendations, the Task Group will examine:

- 5.1 international energy efficiency programs, trends in energy efficiency policy, and recommendations of foreign and international organisations, such as the International Energy Agency;

5.2 impacts and interactions between proposed mechanisms and:
- a the CPRS;
- b the RET;
- c the National Electricity Market, South West Interconnected System and other relevant energy markets; and
- d Commonwealth, state and territory energy efficiency policies and measures including existing NSEE measures;

5.3 the co-benefits of certain energy efficiency improvements, including reductions in non-greenhouse gas air pollution, health benefits, improved energy security, reduced energy costs for households, and infrastructure savings; and

5.4 the views and ideas of experts, and key stakeholders including representatives of the energy industry, end users, states, territories, industry, environment and community groups.

6 The Task Group will release an Issues Paper in March 2010 and make its final recommendations to the Minister for Climate Change, Water and Energy Efficiency and the Minister for Resources and Energy by midyear 2010.

Attachment B: Council of Australian Governments' Complementarity Principles

Complementary measures should be assessed against the following principles:

1 The measures are targeted at a market failure that is not expected to be adequately addressed by the Carbon Pollution Reduction Scheme or that impinges on its effectiveness in driving emissions reductions.

— For example, research and development failures, common use infrastructure issues, information failures and excess market power.

Complementary measures should adhere to the principles of efficiency, effectiveness, equity and administrative simplicity and be kept under review. They may include:
- a measures targeted at a market failure in a sector that is not covered by the Carbon Pollution Reduction Scheme.
- b measures for where the price signals provided by the Carbon Pollution Reduction Scheme are insufficient to overcome other market failures that prevent the take-up of otherwise cost-effective abatement measures.
- c measures targeted at sectors of the economy where price signals may not be as significant a driver of decision making (e.g. land use and planning).
- d some measures in (a) or (b) may only need to be transitional depending on expected changes in coverage or movements in the carbon price.

2 Complementary measures should be tightly targeted to the market failure identified in the above criteria that are amenable to government intervention. Where the measures are regulatory they should meet best-practice regulatory principles, including that the benefits of any government intervention should outweigh the costs.

3 Complementary measures may also be targeted to manage the impacts of the Carbon Pollution Reduction Scheme on particular sectors of the economy (for example to address equity or regional development concerns). Where this is the case, in line with regulatory best-practice, the non-abatement objective should be clearly identified and it should be established that the measure is the best method of attaining the objective.

4 Where measures meet the above criteria, they should generally be implemented by the level of government that is best able to deliver the measure. In determining this, consideration should be given to which level of government has responsibility as defined by the Constitution or convention/practice, the regulatory and compliance costs that will be imposed on the community, and how the delivery of the measure is best coordinated or managed across jurisdictions.

Task Group members

Dr Martin Parkinson
Secretary, Department of Climate Change and Energy Efficiency (Chair)

Dr Martin Parkinson was appointed Secretary of the Department of Climate Change and Energy Efficiency on 8 March 2010 under machinery-of-government changes. Martin had previously been Secretary of the Department of Climate Change from its establishment on 3 December 2007.

Before his appointment as Secretary, Martin spent six years as Deputy Secretary in the Treasury, with responsibility for domestic and international macroeconomic issues, and as Deputy Secretary of the Climate Change Group in the Department of the Prime Minister and Cabinet, with responsibility for leading and coordinating implementation of the emissions trading scheme and coordinating climate change policy.

Drew Clarke
Secretary, Department of Resources, Energy and Tourism

Drew Clarke was appointed Secretary of the Department of Resources, Energy and Tourism in April 2010. Drew's previous position was Deputy Secretary with responsibilities across the three sectors. Drew's earlier roles include Head of the Energy and Environment Division, where he was responsible for energy market reform, energy security and energy-related climate change policy, the business program delivery agency (AusIndustry), and leadership of science agencies.

Dr Gordon de Brouwer
Deputy Secretary, Department of the Prime Minister and Cabinet

Dr Gordon de Brouwer is Deputy Secretary (Economic) in the Domestic Policy Group of the Department of the Prime Minister and Cabinet. In this position, Gordon leads departmental and cross-government policy advice and projects, including on various domestic and international financial, macroeconomic and climate change matters.

Nigel Ray
Deputy Secretary, the Treasury

Nigel Ray is the Executive Director (Deputy Secretary) of the Fiscal Group in the Australian Treasury, a position he has held since May 2008, and a member of the Treasury's Executive Board.

Nigel leads a team that is responsible for managing the Australian Government's budget process and advising the Treasury Ministers on overall budget strategy. The Fiscal Group also advises the Treasury Ministers on government outlays, balance sheet management and Commonwealth–state financial relations.

Advisory Group members

Sharan Burrow
President, Australian Council of Trade Unions (representative for Sharan Burrow was Tony Maher)

Sharan Burrow was elected President of the Australian Council of Trade Unions in May 2000, and President of the global union body, the International Trade Union Confederation, in November 2006.

Sharan is also member of the governing body of the International Labour Organisation.

Greg Bourne
Chief Executive Officer, WWF-Australia

Greg Bourne took up his current position as Chief Executive Officer of WWF-Australia in October 2004.

Previously, Greg was Regional President for BP Australasia, and prior to this role Greg had occupied a number of senior management positions with oversight of BP activities in Latin America, Scotland, Australia and Papua New Guinea. Greg also worked as policy adviser on Energy and Transport for the UK Government in the late 1980s.

Greg is Chair of the National Council on Education for Sustainability, and a member of the Department of Climate Change and Energy Efficiency Adaptation Stakeholder Group.

John Connor
Chief Executive Officer, the Climate Institute

John Connor joined the Climate Institute in March 2007 as Chief Executive Officer.

John initially trained as a lawyer and worked as a research assistant for a judge in the Land and Environment Court of New South Wales. After a stint as an environmental consultant to business, he became a researcher for Dr Peter Macdonald, the Independent member for Manly, during and after Dr Macdonald's role in holding the balance of power for the minority coalition government of the time. From there he ran the Nature Conservation Council of New South Wales and then moved to the Australian Conservation Foundation, helping forge links with farmers and business to develop solutions on salinity and climate change.

Neil Marshman
Chief Consultant, Rio Tinto

Neil Marshman joined Rio Tinto in 1993 and has been Chief Consultant since 2006. In this role, Neil has contributed to Rio Tinto's participation in the Greenhouse Challenge Plus, the development of the *Energy Efficiency Opportunities Act 2006* and the *National Greenhouse and Energy Reporting Act 2007*, as well as in Rio Tinto's responses on emissions trading and renewable energy targets.

Neil is responsible for global programs needed by Rio Tinto for it to meet the undertakings of its climate change position. These include support for government action on climate change, developing low-emissions product pathways and supporting actions at the operations level to reduce emissions.

Clare Martin
former Chief Executive Officer, Australian Council of Social Service (representative for Clare Martin was Tony Westmore)

Clare Martin was appointed in April 2010 a Professorial Fellow at the Northern Institute, a new research and development enterprise at Charles Darwin University. Clare was the Chief Executive Officer of the Australian Council of Social Service (ACOSS) from November 2008 until recently. ACOSS is the peak council of the community services and welfare sector, representing low-income and disadvantaged Australians.

Karen Moses
Executive Director, Finance and Strategy, Origin Energy

Karen Moses is responsible for Origin Energy's corporate strategy and transactional activity, as well as the company's overall risk, including operational HSE, commodity risk, compliance and insurance. Karen oversees the Australia Pacific Liquid Natural Gas Project from an Origin perspective.

Karen is Director of the Energy and Water Ombudsman (Victoria) Limited, Australian Energy Market Operator Limited and Contact Energy Limited in New Zealand. Karen is also a member of the CSIRO Energy and Transport Sector Advisory Council.

Karen joined the Origin Board in March 2009.

Rob Murray-Leach
Chief Executive Officer, Energy Efficiency Council

Rob Murray-Leach is the Chief Executive Officer of the Energy Efficiency Council and has an extensive background in climate change, transport and sustainability, as a member of the secretariat of the Garnaut Climate Change Review and senior policy expert in the South Australian Government.

His academic studies at Oxford and Adelaide universities focused on behaviour and sustainability, and he has contributed to a number of publications in this field.

Cameron O'Reilly
Executive Director, Energy Retailers Association of Australia Limited

Cameron O'Reilly is the Executive Director of the Energy Retailers Association of Australia, Director of the Australian Gas Industry Trust and a member of the Advisory Committee of the Global Energy Think Tank.

In 2009 Cameron researched the impact of climate change policy on the US energy sector while on a Fulbright scholarship at the University of Texas at Austin.

Dr Brian Spalding
Commissioner, Australian Energy Market Commission

Since April 2010, Brian Spalding has been a part-time Commissioner of the Australian Energy Market Commission, and was previously Executive General Manager Operations of the Australian Energy Market Operator, with responsibilities for the operation of the National Electricity Market and gas market operations for the Victorian gas transmission system.

Brian has held executive-level positions in Pacific Power, TransGrid and in the former National Electricity Market Management Company. Brian held key implementation and operational roles in electricity markets in New South Wales and nationally from their conception in the early 1990s.

Secretariat

The Task Group and Advisory Group were supported by an interagency secretariat located in the Department of Climate Change and Energy Efficiency. The secretariat was headed by Mr Howard Bamsey, a Deputy Secretary in the Department of Climate Change and Energy Efficiency.

The secretariat also included:

Ms Bridget Brill, Ms Alison Reeve, Mr Dugald Murray, Ms Kathryn Smith and Ms Zoe Lagarde of the Department of Climate Change (now the Department of Climate Change and Energy Efficiency)

Mr Ross Carter, Mr David Brunoro, Mr Chris Baker and Ms Deborah McCabe, of the Department of the Environment, Water, Heritage and the Arts (and subsequently of the Department of Climate Change and Energy Efficiency)

Ms Jenny Allen of the Treasury

Ms Louise Vickery and Ms Sarea Coates of the Department of Resources, Energy and Tourism

Additional assistance was provided by Ms Serena Fletcher, Mr Dale Johansen, Mr Steven O'Keefe and Mr Jon Shaw.

Submissions received from organisations

ABB Australia

AGL Energy

Air Conditioning and Mechanical Contractors' Association of Australia Limited

Air-Conditioning and Refrigeration Equipment Manufacturers Association (AREMA)

air2energy

Alcoa (Australia)

Alstom Limited

Asciano

Association of Building Sustainability Assessors Inc

Australasian Railway Association Inc

Australian Alliance to Save Energy (A2SE)

Australian Aluminium Council Limited

Australian Centre for Sustainable Business and Development, University of Southern Queensland

Australian Conservation Foundation Inc

Australian Council of Social Service (ACOSS)

Australian Council of Trade Unions

Australian Energy Market Operator

Australian Industry Greenhouse Network

Australian Industry Group

Australian Information Industry Association

Australian Institute of Architects

Australian Institute of Landscape Architects

Australian Institute of Petroleum

Australian Institute of Refrigeration Air Conditioning and Heating

Australian Meat Industry Council

Australian Network of Environmental Defender's Offices

Australian Petroleum Production & Exploration Association Limited

Australian Plantation Products and Paper Industry Council (A3P)

Australian Services Unions

Australian Sustainable Built Environment Council

Australian Wind Energy Institute

Ballarat Renewable Energy and Zero Emissions Inc (BREAZE Inc)

Bankstown City Council

Better Place Australia

BHP Billiton

Brotherhood of St Laurence

Bureau of Steel Manufacturers of Australia

Caltex Australia

Carbon Training International

Carbon Trust Australia

Submissions received from organisations *continued*

Care Inc Financial Counselling Service

Cement Industry Federation

Chevron Australia

City of Melbourne

City of Sydney

Clean Energy Council

Climate Control Industry Alliance

ClimateWorks Australia

Coledale–Austinmer Sustainable Community Focus Group

Colley Consulting

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

ComputersOFF.ORG

Consult Australia

Consumer Utilities Advocacy Centre

Copper Development Centre Australia

Country Energy

CSR Limited

Dak Sriram Pty Ltd

dandolopartners

DBP Transmission

DUX Hot Water

Eastern Metropolitan Regional Council

ecovantage

Electrical Trades Union of Australia Victorian Branch

Energeering Pty Ltd

Energetics Pty Ltd

ENERGEX Limited

EnergyAustralia

Energy Decisions

Energy Developments

Energy Efficiency Council

Energy Imaging (Canberra)

Energy Imaging (Tasmania)

Energy Makeovers

Energy Networks Association

Energy Retailers Association of Australia

Energy Supply Association of Australia

Energy Users Association of Australia

Engineers Australia

Environment Victoria

Ergon Energy

ERM Power

Ethnic Communities Council of NSW Inc

Facility Management Association of Australia

Fire Protection Technologies

Ford Motor Company (Australia)

Future Climate Australia

Gas Industry Alliance

GE Energy Australia and New Zealand

Green Building Council of Australia

Green Energy Trading

HAC Consulting Pty Ltd

Hobsons Bay City Council

Housing Industry Association Limited

Hydro Tasmania

Integral Energy Australia

International Power Australia

Jemena Limited

Just Change Australia

Lake Macquarie City Council

Lend Lease Corporation, WSP Lincolne Scott, Built Ecology

Lighting Council Australia

LMS Generation

Master Builders Australia

Submissions received from organisations *continued*

Mildura Development Corporation
Mito Energy
Moreland Energy Foundation
National Generators Forum
National Institute of Economic and Industry Research
New South Wales Government
Norske Skog Paper Mills (Australia)
Northern Alliance for Greenhouse Action
NSW Business Chamber
Onzo Limited
Origin Energy
Parramatta Climate Action Network
Perth Region NRM
pitt&sherry
Planet Savers Australia
Planning Institute Australia
Plumbing Joint Training Fund
Property Council of Australia
Qenos
Queensland Council of Social Service (QCOSS)
Queensland Government
Rheem Australia
Rio Tinto
RMIT Centre for Design
Royal Automobile Club of Queensland (RACQ)
SA Water
Santos
Schneider Electric (Australia)
Shell Companies in Australia
Shopping Centre Council of Australia
Siemens (Australia and New Zealand) Limited
Smart Grid Australia
Smartcool Systems Australia
South Australian Wine Industry Association
Southern Councils Group (three submissions)
Southern Sydney Regional Organisation of Councils
Sustainable Jamboree
Szencorp
Tasmanian Council of Social Service (TasCOSS)
Tasmanian Government
Technoform Australia and New Zealand
Tenants Union of Victoria
Think Brick Australia
Thinkwell Australia
TNT Australia
Total Environment Centre
Tourism and Transport Forum Australia
Tropical Green Building Network
TRUenergy Australia
Victorian Council of Social Service (VCOSS)
Victorian Employers' Chamber of Commerce and Industry
Visy
Voluntary Carbon Market Association
WA Sustainable Energy Association
Warringah Council
Women's Health in the North
Woodside Energy

Submissions received from individuals

Christina Altenkirch
Brian Bartlett
Jeff Beal
Stephen Bray
David Chambers
Martin Cousins
Chris Dalitz
Annie Damelot and John Bushell
Michael Fullelove
Andrew Hodgkinson
Philip Laird
David Lyon
Donald Payne and Marcus Wearing-Smith
Alan Pears
Anthony Pease (two submissions)
Kaye Ringl
Jack Sturgess
Stephen White
Michael Yastreboff

APPENDIX D Comparison of National Strategy on Energy Efficiency measures and Task Group proposals

The table provides a comparison of the key elements and indicative pathways of the measures in the National Strategy on Energy Efficiency and the Task Group proposals.

NSEE measures	Task Group proposals
Overarching actions • Measure 1.4.1 - Improve data through the Energy Efficiency Data Project (does not include transport)	**Overarching actions** • Set an aspirational national energy efficiency target of improving primary energy intensity by 30 per cent between now and 2020 • Introduce a transitional national energy savings initiative to replace existing and planned state energy efficiency schemes, subject to detailed consultation on its design • Improve the data, information and analysis tools necessary to enable energy efficiency innovation, to track the national target, and to underpin future policy development
Industry and business • Measure 1.1.1 - Support for small and medium sized enterprises (SMEs) including information, training, financial assistance and demonstration projects **Advice and education** • Measure 1.3.1 - Web portal for clear and consistent information • Measure 1.3.1 - Tools to identify emission reductions from energy savings • Measure 1.3.2 - Government jurisdictions to collaborate on developing community behaviour and communications campaigns • Measure 1.3.3 - Implement consumer energy bill benchmarking **Appliances and equipment** • Measure 2.2.5 - Develop additional consumer information programs (for example, mandating appliance star ratings in advertising material)	**Building an energy efficiency culture** • Develop and design a long-term national strategy to build a culture of energy efficiency that would include the following actions: *Motivating energy efficiency* • A compelling rationale and call to action carefully framed by research • A simple, consistent and meaningful language/metrics used consistently across all measures • Provide individually relevant feedback, through for example bill benchmarking and real-time monitoring • Visible rewards for action to promote role models and leadership *Making action on energy efficiency easier* • Expansion of point-of-decision information and labels, for example through better retailer training, product coverage and comparability, and introduction of a simpler endorsement label where appropriate • Streamlining existing web information and promoting more effective web services • Addressing gaps in support for small businesses • Addressing credibility issues for service providers *Triggering action through communication and engagement* • A large-scale approach for essential awareness raising, and education • Targeted strategies such as partnerships with community and business networks; school and higher education strategies; and Web 2.0 activities

NSEE measures	Task Group proposals
Industry and business • Measure 1.1.1 - Expansion to the Energy Efficiency Opportunities (EEO) program to include small users • Measure 1.1.1 - Industry targeted funding and information	**Large energy users** • Consider expanding the Energy Efficiency Opportunities program to include energy generators, and electricity and gas transmission and distribution networks • Consider reviewing and enhancing the Energy Efficiency Opportunities assessment and verification requirements and capacity building recognition tools • Consider requiring substantial greenfield and expansion projects to assess and report on energy efficiency opportunities at the design and commissioning phase • Consider introducing a large energy users demonstration incentive
Transport • Measures 2.3.1, 2.3.3 and 2.3.4 - A package of measures to improve the fuel efficiency of the Australian vehicle fleet including: assessing the costs and benefits of introducing CO_2 emissions standards for light vehicles; developing a code of practice on including fuel consumption and emissions data in vehicle advertisements; and voluntary measures to improve the efficiency of heavy and passenger vehicle fleets • Measure 2.3.2 - Encourage the domestic car manufacturing industry to develop and build more efficient passenger motor vehicles • Measure 2.3.5 - Develop eco-driving program	**Transport** *Strategic frameworks and urban mobility* • Consider explicitly linking Commonwealth transport infrastructure funding to energy efficiency outcomes • Consider requiring Infrastructure Australia to assess all proposals for funding of transport projects not just those made through the Building Australia Fund • Move towards best practice transport and infrastructure appraisal processes including consistent and up-to-date estimates of variables and increasing transparency in transport infrastructure appraisal processes • Encourage states and territories to implement recommendation 61 from the review of Australia's future tax system on congestion pricing • Consider implementing a 'Smart City' transport initiative as a priority investment area for public and active transport *Light vehicles* • Consider supporting the Global Fuel Economy Initiative's '50 by 50' campaign, a global project to make cars 50 per cent more fuel efficient than 2005 levels by 2050 • Consider introducing mandatory CO_2 standards for light vehicles • Consider setting an emissions target for the Commonwealth vehicle fleet; encouraging states and territories without targets to join a Commonwealth target if one was implemented; setting an ambitious but achievable definition of an environmentally friendly Australian-made car and linking this definition to the provision of funding under the Green Car Innovation Fund • Consider implementing recommendation 9b of the review of Australia's future tax system on reforming the treatment of vehicles under fringe benefits tax • Investigate enhancements to existing vehicle labelling, additional promotion of the existing Green Vehicle Guide and the feasibility and desirability of expanding some form of labelling to second hand cars sold through dealerships • Where they retain these measures, encourage states and territories to consider revising both stamp duty and registration for new light vehicles to establish differential charges linked to environmental performance *Freight* • Consider facilitating trials to evaluate low-emissions, energy efficient technologies for commercial vehicles • Continue to monitor the development and implementation of international heavy vehicle standards with a view to their introduction when determination of emissions performance is feasible
Government leadership and partnership • Measure 4.1.2 - Establish a national TelePresence conferencing network to reduce Government travel • Measure 4.1.3 - Improve the fuel efficiency of Government vehicle fleets	

NSEE measures	Task Group proposals
	Electric vehicles • Consider supporting Standards Australia to undertake a costed work program for electric vehicle standards • Consider making a clear announcement that, conditional on the decarbonisation of the Australian electricity supply proceeding as forecast or the availability of renewable energy to charge vehicles, Australia sees electric vehicles as a potential part of our future vehicle mix

NSEE measures	Task Group proposals
Industry and business • Measure 1.1.1 - Innovative funding for investment in energy efficiency in existing commercial buildings and other business operations **Advice and education** • Measure 1.3.4 - Showcase and promote energy efficiency technologies **Making buildings more efficient** • Measure 3.1.1 – Develop a consistent outcomes-based national building energy standard setting, assessment and rating framework • Measure 3.2.1 – Increase the stringency of energy efficiency requirements for commercial buildings through the Building Code of Australia • Measure 3.2.2 - Phase in mandatory disclosure of energy efficiency of commercial buildings • Measure 3.2.3 – Implement the Heating, Ventilation and Air Conditioning (HVAC) High Efficiency Systems Strategy • Measure 3.3.1 - Increase the stringency of energy efficiency requirements for residential buildings through the Building Code of Australia • Measure 3.3.2 - Phase in mandatory disclosure of residential building energy, greenhouse and water performance at point of sale or lease • Measure 3.3.3 - Incentives for residential building energy efficiency improvements • Measure 3.3.4 - States and territories to audit energy efficiency of public housing stock • Measure 3.3.5 - Address opportunities to support solar access for new buildings through building lot or precinct level layout • Measure 3.3.6 – Provide and promote residential energy efficiency information • Measure 3.3.7 - Improve understanding of the energy efficiency of Australia's existing housing stock **Government leadership and partnership** • Measure 4.1.1 - Governments to improve energy performance of buildings they own or occupy through initiatives such as energy performance contracting, the National Green Lease Policy, and the National Framework for Sustainable Government Office Buildings	**Buildings** • Consider the development of a pathway towards zero-emissions buildings • Consider strengthening Australia's capacity to assess building energy use

NSEE measures	Task Group proposals
Industry and business • Measure 1.1.3 – Maximise the potential for the application of distributed generation technologies that increase energy efficiency, including co-generation and tri-generation	**Delivering innovation — energy-efficient hubs** Consider investing in trials of: • Industrial hubs that could demonstrate energy synergies (and energy efficiency/distributed generation technologies) in regional network constrained areas, and manufacturing and mining activities • Net zero-emissions urban hubs that could showcase new high-technology and low-emissions residential buildings and precincts • Central business district hubs that could trial retrofits for highly energy-efficient commercial buildings and district-scale energy solutions
Electricity markets • Measure 2.1.1 – Consider the effectiveness of electricity market in bringing forward demand side energy efficiency measures • Measure 2.1.2 - Encourage smarter and more efficient energy networks (for example, smart grids)	**Energy markets** • Consider removing the exemption for generators in the *Energy Efficiency Opportunities Act 2006* to ensure that they identify possible cost-effective energy efficiency improvements • Consider the inclusion of electricity and gas transmission and distribution networks in the Energy Efficiency Opportunities Act, and require that they identify measures to reduce losses in the networks where the benefits to the market of doing so clearly outweigh the costs • Consider tasking the Australian Energy Market Commission/ Australian Energy Regulator to provide stronger regulatory oversight of the regulatory investment test process • Consider requiring the Australian Energy Regulator to review the effectiveness of the Demand Management Incentive Scheme measures (building on previous improvements in this area) • Consider the acceleration and expansion of the current Ministerial Council on Energy work to streamline distributed generation connection processes • Consider encouraging more efficient, cost-reflective price signals in energy markets, including time-of-use pricing where appropriate • Consider tasking the Ministerial Council on Energy to incorporate any national energy efficiency target into National Electricity Market governance arrangements • Consider requiring the Australian Energy Regulator to undertake a regular energy efficiency performance review of relevant National Electricity Market participants which would allow for monitoring of improvements over time • Consider tasking the Australian Energy Market Commission to consider any supporting changes in the National Electricity Rules in the context of this package of options
Industry and business • Measure 1.1.2 – Assist business and industry, in particular the energy services sector, to develop skills and capacity (including through identifying and addressing skills gaps) **Government leadership and partnership** • Measure 4.1.3 - Greater emphasis on energy efficiency as part of broader improvements to the sustainable procurement practices of government	**Role of energy service companies** • Consider a revolving financing mechanism to support building energy efficiency improvements across community facilities • Consider setting new targets for Commonwealth government buildings (leased or owned) and establishing a revolving building fund for Commonwealth government portfolios to bid for retrofit upgrades • Consider working with relevant industry associations, education and training service providers and other stakeholders to develop and promote an accreditation and training regime for energy service companies

NSEE measures	Task Group proposals
Appliances and equipment • Measure 2.2.1 - Accelerate and expand the Minimum Energy Performance Standards and labelling program • Measure 2.2.2 - Establish national legislation for Minimum Energy Performance Standards and labelling, and move to add Greenhouse and Energy Minimum Standards (GEMS) • Measure 2.2.3 - Phase out inefficient lighting products, commencing with incandescent globes • Measure 2.2.4 - Phase out inefficient and greenhouse-intensive hot water systems • Measure 4.1.4 – Increase energy efficiency of street lighting, including reviewing and considering mandatory standards for street lighting energy efficiency	**Energy efficiency standards, ratings and labels** • Consider enhancing the current greenhouse and energy minimum standards (GEMS) legislative development process to streamline, accelerate and widen minimum energy performance standards (MEPS), and introduce high energy performance standards (HEPS) • Consider developing standards for priority systems • Consider developing an endorsement label for HEPS • Consider mandating the procurement of HEPS rated products for Australian government operations and encourage jurisdictions to do the same • Consider the introduction of mandatory disclosure of the energy efficiency of a range of products and services in advertising and promotional material
Industry and business • Measure 1.1.2 – Assist business and industry to develop skills and capacity (including through identifying skills gaps and developing a long term training strategy for energy efficiency assessment skills) **Skills and training** • Measure 1.2.1 - Develop the National Energy Efficiency Skills Initiative (NEESI) • Measure 1.2.2 - Strengthen national energy auditing and assessment capability	
	Governance Improve governance structures, including: • Consider giving a single ministerial council, which is able to drive whole-of-government support, responsibility for energy efficiency • Consider establishing a new Australian Energy Commission to coordinate national action or, as an alternative, establish an Energy Efficiency Commission

APPENDIX E International energy efficiency targets

This appendix summarises energy efficiency targets and actions adopted by selected countries, the European Union, and the Asia–Pacific Economic Cooperation (APEC) forum. Emissions targets and renewable energy targets are also listed.

A number of other countries not listed here have committed to generally voluntary energy efficiency measures as part of their Copenhagen Accord commitments, including Brazil, Indonesia, Mauritania, Singapore, Togo and Tunisia.

	Energy efficiency/ intensity target	Energy efficiency actions	Emissions target	Renewable energy target
Australia	No current target.	Australia's energy efficiency measures cover large energy users, appliances, government, and commercial and residential buildings. Measures include financial incentives such as revolving funds and direct investment, building codes, education and minimum energy performance standards (MEPS).	5–15 or 25% below 2000 levels by 2020.	20% by 2020.
European Union	20% reduction in energy consumption by 2020 compared with projected business as usual.	Measures focus on the manufacturing, transport, residential and commercial buildings sectors. Action areas include appliance standards and labelling, minimum performance standards for buildings, cogeneration, binding generator efficiency requirements, vehicle emissions standards, an urban transport green paper, behaviour change programs, direct investment and favourable taxation.	20–30% below 1990 levels by 2020.	20% by 2020 (10% specifically in transport sector).
United Kingdom	9% reduction in energy consumption below 2007 levels by 2016.	The UK targets the residential, business, public and transport sectors. Policies and programs include a residential carbon emissions reduction commitment, building regulations, a levy, carbon trust programs, revolving loan funds (public sector only) and a transport voluntary agreement package.	34% below 1990 levels by 2020 (21% has already been achieved).	15% by 2020.
United States	20–25% reduction in the emissions intensity of its GDP below 2005 levels by 2020.	US action includes energy efficiency measures in the transport, public, private, residential and energy utility sectors. Specific actions include tax credits for hybrid vehicles, light vehicle tyre pressure monitoring systems, utility-based demand-side management programs, appliance rebates and labelling, low-income household support, grants programs, smart grid investment, lighting standards and a phase-out of incandescent lamps.	Around 17% below 2005 levels by 2020.	No target. The American Power Act would establish a target of 20% by 2020.

	Energy efficiency/ intensity target	Energy efficiency actions	Emissions target	Renewable energy target
Canada	No national target. Individual provinces and territories set a target of 20% by 2020.	Canadian action has focused broadly on all sectors and specifically on commercial and residential buildings, industry and the transport sectors. Specific federal actions include energy efficiency indicators (all sectors), voluntary promotion initiatives (all sectors), MEPS, phase-out of incandescent lighting, tools and training (building owners), and industry support programs. Individual provinces' and territories' actions include building codes, regulations, new government green building policies, home energy audits, retrofit assistance and transport education programs.	17% below 2005 levels by 2020.	90% electricity from 'carbon free' sources (hydro, nuclear or wind power) by 2020.
China	20% improvement in energy intensity below 2005 levels by 2010. 40–45% reduction in the emissions intensity of its GDP below 2005 levels by 2020.	China's measures cover the transport, electric utility, industry, residential and commercial building sectors. Specific actions include demand-side management programs, public benefits wires charges, clean energy technology tax incentives, distributed generation policy mechanisms, building codes, demonstration projects, appliance and equipment standards, nationwide labelling programs and tools development for decision makers.	No target.	10% by 2010 and 15% by 2020.
India	5% reduction in energy consumption by 2015 (for specified entities). 20–25% reduction in the emissions intensity of its GDP below 2005 levels by 2020.	India's National Mission on Enhanced Energy Efficiency (NMEEE) concentrates on large energy users, energy service companies and energy utilities. The NMEEE outlines four proposals: a market-based system for large energy users, promoting innovative energy-efficient appliances, demand-side management financial mechanisms and further financial incentives.	No target.	No overall target. Commitment to deploy 20,000 MW solar by 2020.
Japan	30% improvement in energy intensity below 2003 levels by 2030.	Japan has already improved energy efficiency by around 30% in the last 30 years. Further action will focus on the industrial, civil (commercial and residential) and transport sectors. Specific actions include mandatory energy reporting and saving for industrial and commercial sectors, housing regulations, a 'top runner' program for private companies, appliance standards, data collation and analysis, private sector direct investment (through budget, tax breaks and policy), loans for residential building buildings meeting a certain thermal standard only, and heavy vehicle fuel standards.	25% below 1990 levels by 2020.	Possible target of 20% by 2020.
Russia	40% improvement in energy intensity below 2007 levels by 2020.	Russia's energy efficiency measures cover the power industry, construction, housing and transport sectors. Specific actions include the development of a regulatory framework, direct investment, public–private partnerships, education, building codes, and a phase-out of incandescent lighting.	15–25% below 1990 levels by 2020.	Possible target of 4.5% by 2020.

	Energy efficiency/ intensity target	Energy efficiency actions	Emissions target	Renewable energy target
France	2% improvement in the energy intensity of its GDP per year to 2015, and 2.5% per year to 2030.	French energy efficiency measures focus on buildings, financing and the appliance and transport sectors. Specific actions include building codes, building demonstration projects, mandatory building energy labelling and performance standards, zero-interest loans, preferential tax credits, and direct investment for innovative and low-carbon vehicles.	Contributes to EU collective 2020 target.	23% by 2020.
Germany	9% reduction in energy consumption between 2007 and 2016. This incorporates a target of 933 PJ by 2016.	Germany focuses broadly on all sectors and specifically on commercial and residential buildings and the transport sector. Specific actions include stringent building codes, subsidies and information for passive building design, a target and direct funding for retrofitting existing buildings, labelling for lighting, mandatory heavy vehicle tyre monitoring equipment and fuel efficiency standards for passenger cars.	Contributes to EU collective 2020 target.	18% by 2020.
Italy	9.6% improvement in energy efficiency by 2016.	Italy's energy efficiency measures cover the energy, building and transport sectors. Specific actions include the extension of the white certificate trading scheme from 2009 to 2014, financial support (including revolving funds) for buildings and energy use equipment, additional tax deductions for buildings and direct incentives for energy-efficient vehicles.	Contributes to EU collective 2020 target.	17% by 2020.
APEC	25% (aspirational) reduction in energy intensity below 2005 levels by 2030.	APEC encourages all participant economies to share information, undertake voluntary peer review, and set individual goals and action plans. APEC has developed best practice guidelines, local bank training programs and utility-based financing mechanisms.	No target.	No target.

Sources

Asia–Pacific Economic Cooperation: www.ewg.apec.org/documents/EWG37_11thESIreport2009.pdf (accessed 2 June 2010); www.apec.org/etc/medialib/apec_media_library/downloads/news_uploads/2007aelm.Par.0001.File.tmp/07_aelm_ClimateChangeEnergySec.pdf (accessed 2 June 2010).

Canada: www.iea.org/press/pressdetail.asp?PRESS_REL_ID=300 (accessed 27 May 2010).

China: www.cresp.org.cn/uploadfiles/2/967/medium%20and%20long-term%20development%20plan%20for%20re%20in%20china%20eng.pdf (accessed 27 May 2010); www.efchina.org/FProgram.do?act=list&type=Programs&subType=1 (accessed 27 May 2010).

European Union: europa.eu/legislation_summaries/energy/energy_efficiency/l27064_en.htm (accessed 28 May 2010); http://ec.europa.eu/energy/efficiency/index_en.htm (accessed 11 May 2010); http://ec.europa.eu/energy/renewables/targets_en.htm (accessed on 27 May 2010).

G8: www.iea.org/G8/docs/Efficiency_progress_g8july09.pdf (accessed 24 May 2010).

Germany:: http://ec.europa.eu/energy/demand/legislation/doc/neeap/germany_en.pdf (accessed 17 June 2010).

India: http://mnre.gov.in/pdf/mission-document-JNNSM.pdf (accessed 27 May 2010); www.indiaenvironmentportal.org.in/content/national-mission-enhanced-energy-efficiency-nmeee-note (accessed 2 June 2010); www.pib.nic.in/release/release.asp?relid=55875 (accessed 11 April 2010); http://unfccc.int/files/meetings/application/pdf/indiacphaccord_app2.pdf (accessed 27 May 2010).

Japan: www.meti.go.jp/english/information/downloadfiles/PressRelease/NewEnergyStrategy.pdf (accessed 24 May 2010); www.bloomberg.com/apps/news?pid=20601072&sid=af1wBmkh0Odo (accessed 13 July 2010).

Russia: http://unfccc.int/files/meetings/application/pdf/russiacphaccord_app1engl.pdf (accessed 17 June 2010); http://themoscowtimes.com/business/article/government-aims-for-45-renewable-energy-by-2020/373745.html (accessed 28 May 2010).

United Kingdom: www.direct.gov.uk/en/Nl1/Newsroom/DG_179190 (accessed 27 May 2010).

United States: www.awcia.org/AnnouncementRetrieve.aspx?ID=47225 (accessed 27 May 2010).

The Task Group commissioned analysis to illustrate the costs, benefits and other impacts of a hypothetical national energy savings initiative.

The illustrative analysis suggests that Australia can achieve significant energy efficiency improvement at very low cost and that power bills could be constrained below what would otherwise be the case. Further careful consideration is warranted.

The illustrative analysis assumes that there are many untapped opportunities to save energy at low or no overall cost (the results of the Energy Efficiency Opportunities program and data from the NSW Greenhouse Gas Reduction Scheme (GGAS) for industry support this finding), including for households.

However, the results should not be interpreted as definitive. The modelling results are dependent on the input assumptions, particularly assumptions regarding net negative costs for energy efficiency. The results provide a strong case for detailed consultation and analysis on the design of a possible national energy savings initiative.

Scenarios and assumptions

The results of this analysis should be considered as illustrative only. The design of a national energy savings initiative would need to be subject to further analysis and consultation. However, in order to undertake this illustrative analysis, assumptions were required regarding some key design parameters. These assumptions should not be taken as representing the Task Group's recommendations or in any way pre-empting the Government's consideration of the value of a national energy savings initiative.

The Task Group examined four scenarios and two reference scenarios:

- Scenario 1: a national expansion of the NSW Energy Savings Scheme covering electricity only and a –5 emissions reduction target.
- Scenario 2: a national energy savings initiative (covering gas and electricity) with a relatively moderate target and a –5 emissions reduction target.
- Scenario 3: a national energy savings initiative (covering gas and electricity) with a relatively stringent target and a –5 emissions reduction target.
- Scenario 4: a national energy savings initiative (covering gas and electricity) with a relatively stringent target and a –15 emissions reduction target.
- Reference scenario 1: no national energy savings initiative and a –5 emissions reduction target.
- Reference scenario 2: no national energy savings initiative and a –15 emissions reduction target.

Two emissions reduction targets were considered for the purposes of this analysis: achievement of Australia's –5 emissions reduction target (that is, reducing emissions to 5 per cent below 2000 levels by 2020), with a carbon price equivalent to the international carbon price coming into effect from 2013–14; and achievement of Australia's –15 emissions reduction target (that is, reducing emissions to 15 per cent below 2000 levels by 2020), with a carbon price equivalent to the international carbon price coming into effect from 2013–14.

In scenarios 1–4 the hypothetical national energy savings initiative is assumed to commence in 2011–12 (with a very low obligation in the first year). The target increases incrementally to 2014–15, and then remains steady until the emergence of a mature carbon price (assumed to occur in 2019–20 for the purposes of this analysis).

It is assumed that only those energy efficiency measures with payback periods of three years or less for households and between two and five years for industry are taken up (as the Energy Efficiency Opportunities program is assumed to capture all industry opportunities with a payback period of up to two years).[1]

A number of assumptions were also made regarding existing policies and measures, technology availability and costs, and demographic and economic factors. These include electricity demand projections by the Australian Energy Market Operator, the Western Australia Independent Market Operator and the Utilities Commission of the Northern Territory. The modelling results are sensitive to assumptions regarding key parameters.

In the reference scenarios, all existing policies and measures were retained. In scenarios 1–3, existing policies and measures were retained with the exception of state and territory energy efficiency schemes, which are assumed to terminate by 30 June 2011 to allow the emergence of a national initiative.

Other options for policies and measures that are presented in this report are excluded from this modelling exercise, although they would have an impact on the overall level of energy savings and the contribution of each sector.

There are some limitations with this analysis, including that it does not extend to broader whole-of-economy impacts from deferred investment, loss of generator profits and jobs growth in the companies that provide energy efficiency products and services to homes and businesses, which may all have distributional impacts on the electricity generation industry and wider economy. Further analysis would be required to estimate these impacts.

Results

The illustrative analysis suggests that, compared to the reference scenarios, the introduction of a national energy savings initiative leads to:

- lower energy costs—in 2020, the average annual reduction in household expenditure on electricity (for all households) is estimated at around $87 to $180.[2] For those households that implement energy savings measures, the benefits would be even larger—on average, for a household implementing two energy savings technologies, there could be annual saving of up to $296 in 2020 when compared with business as usual
- lower energy demand—in 2020, electricity demand is estimated to be reduced by between 3 per cent and 7 per cent and gas demand by between 2 and 7 per cent (no non-electricity generation gas saving in scenario 1)
- lower peak demand—in 2020, peak electricity demand is estimated to be reduced by up to 1,400 MW relative to the reference case
- lower energy prices—in 2020, retail electricity prices are estimated to be around 1 to 6 per cent lower than in the reference scenarios in the National Electricity Market (NEM) and 2 to 3 per cent lower than in the reference scenarios in the

South West Interconnected System (SWIS), while residential gas tariffs are estimated to increase by up to 2 per cent

- deferred investment in new generating plant, transmission networks and gas infrastructure — and avoided operating and maintenance costs — equivalent to between $3.5 billion and $12 billion over the period 2012 to 2040[3]
- an increase in fuel efficiency and decrease in emissions intensity
- lower generator profits — estimated at around $600 million to $1.5 billion over the period 2012 to 2020[4]
- a net benefit over the period to 2040 of between $2 billion and $6.6 billion.[5]

Energy demand

The analysis suggests that compared to the reference scenarios, the introduction of a national energy savings initiative leads to a potential additional permanent reduction in energy demand (beyond the life of the policy), although in all scenarios energy demand continues to grow.

In 2020, electricity savings amount to between 7,000 GWh and 19,000 GWh. Similarly, in 2020, gas savings amount to between 24 PJ and 69 PJ. (The quantum of energy savings depends on the design of the national energy savings initiative and the stringency of the target.)

Energy savings continue for a number of years after the termination of the national energy savings initiative, and then continue, albeit at a lower level than the peak.[6] This can be attributed to energy efficiency technologies generally having an effective life of several years (in some instances this may be for the life of the building), as well as a behavioural change aspect contributing to longer-term energy savings (assumed to be 50 per cent for the purposes of this analysis).

Peak electricity demand

The hypothetical national energy savings initiative is also estimated to lead to a reduction in peak electricity demand. In 2020, peak demand is reduced by up to 1,400 MW relative to the reference scenarios.

Energy savings by customer type

In scenarios 1–3, around half of the savings in energy use are from a reduction in electricity use, reflecting opportunities and take-up of energy-efficient technologies and activities (discussed further below) and the following factors:

- electricity use comprises a larger proportion of total energy use
- electricity use faces a more stringent target (no target applies to gas in scenario 1 and a more stringent target applies to electricity in scenarios 2–3).

As the carbon and energy savings targets increase so too does the proportion of energy savings coming from gas use and consequently from the industrial sector. This can be attributed to higher certificate prices under an energy savings initiative with more stringent targets bringing forward more costly opportunities in the industrial sector (which is a major user of gas).

Of the reduction in electricity use, around 50 per cent occurs in the residential sector, although this declines to under 40 per cent in scenario 4. The relatively high proportion of electricity savings achieved in the residential sector can be attributed to assumptions about the types and availability of energy efficiency opportunities in each sector as well as payback periods. In particular it is assumed that:

- the Energy Efficiency Opportunities program captures opportunities in the industrial sector with a payback period of up to two years
- the opportunities for energy efficiency in some sectors are likely to be limited. For instance, metal smelting (which comprised around 26 per cent of electricity

use in 2007–08) is likely to be already relatively energy efficient given the high cost of electricity as a production input.

However, it is likely that industrial energy efficiency improvements could be greater, as firms do not currently pursue all opportunities with paybacks of two years or less. If this were the case, the costs in the analysis might be further decreased.

Of the reduction in gas use, over 85 per cent occurs in the industrial sector in all scenarios, reflecting a higher incidence of gas use in this sector and assumptions about the types and availability of energy efficiency opportunities in each sector as well as payback periods.

Energy prices

Under a hypothetical national energy savings initiative, wholesale electricity prices are generally lower relative to the reference scenarios in all states. Wholesale prices fall due to the creation of a supply surplus (demand growth is slowed but capacity increases as a result of the Renewable Energy Target) and the deferral of investment in relatively expensive new thermal capacity.

Negative energy efficiency costs lead to the possibility of a marginal impact on retail electricity prices. This is lower than the impact on wholesale prices, as they are offset by transaction costs associated with the national energy savings initiative. In addition, reductions in wholesale prices are not passed on equally, as retail prices vary by state and customer class.

In 2020, retail electricity prices are reduced by between 1 and 6 per cent in the NEM and 2 and 3 per cent in the SWIS.

Lower retail electricity prices and demand results in an average reduction in household expenditure on electricity when compared to the reference scenarios. In 2020, the average annual reduction in household expenditure on electricity (for all households) is equal to around $87 to $180. For those households that implement energy savings measures, the benefits would be even larger — homes would be more comfortable and use less energy and the combination of lower energy use and lower electricity prices would mean even larger bill savings. On average, for a household implementing two energy savings technologies, there could be annual saving of up to $296 in 2020 when compared with business as usual.

Wholesale gas prices are also slightly lower, although residential gas tariffs increase, when compared to the reference scenarios. In 2020, residential gas tariffs increase by around 0.2 per cent to 2 per cent, although larger increases occur earlier. While demand for gas falls as a result of the energy savings initiative, retail gas tariffs are estimated to increase by up to around 2 per cent in 2020. This is because the wholesale gas price is largely driven by international factors and demand for gas as a fuel in electricity generation. Consequently, there is no corresponding fall in wholesale gas prices to counter the increase in retail gas compliance costs.

Price regulation

Retail energy price determinations by state- and territory-based energy regulators would include the costs and benefits of a national energy savings initiative. For instance, state-based regulators have allowed energy retailers to pass on a small cost for similar state-based schemes. This is offset against the change in the expected wholesale electricity price (which, based on the illustrative analysis undertaken by the Task Group, is estimated to fall on average by a larger amount than the impost associated with the initiative). So while retailers may identify additional costs associated with the initiative, and may even list a cost associated with the initiative on energy bills, retail prices are estimated to fall over time. These issues would

need to be considered in detail in any subsequent scheme design consideration and analysis, including how costs and benefits associated with a national energy savings initiative are communicated.

Investment

Saving energy defers the need to invest in new electricity and gas infrastructure. Consequently, investment in all generation, including gas-fired and renewable energy, is lower under a national energy savings initiative than in the reference scenarios. Over the period 2012 to 2040, savings in avoided electricity generation, transmission infrastructure and gas infrastructure investment — and avoided operating and maintenance costs — total between $3.5 billion and over $12 billion.[7]

Fuel efficiency and emissions intensity

In all scenarios there is a trend towards greater fuel efficiency and lower emissions intensity of electricity generation (the amount of energy required to produce a unit of electricity). Under a national energy savings initiative, fuel efficiency improves by a larger amount than the underlying trend, primarily due to reduced electricity demand combined with continued investment in renewable generation as a result of the Renewable Energy Target.

Generator losses

A corollary to the lower wholesale prices is that profits to existing generators are also likely to fall. Depending on the scenario, profits to existing generators are expected to fall by around $600 million to $1.5 billion over the period 2012 to 2020.[8] (Total generator profit is estimated at around $40 billion over the same period.) However, this does not represent a loss to the economy, as there is a countervailing benefit to energy users through lower energy costs (although there may be distribution effects).

Compliance and administration costs

The replacement of multiple state-based schemes with a single national energy savings initiative could also reduce complexity for retailers and governments.

Notes

1 These are the opportunities identified by businesses that have or are to be adopted. In the recent review of the Energy Efficiency Opportunities program, these are reported as 41.6 PJ per year (*First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program,* Commonwealth of Australia, 2010).

2 Nominal dollars.

3 In present value terms (2010) assuming a discount rate of 6 per cent.

4 In present value terms (2010) assuming a discount rate of 6 per cent.

5 In present value terms (2010) assuming a discount rate of 6 per cent.

6 Cumulative actual energy savings over the period 2012 to 2020 (the sum of annual energy savings over the period) are less than cumulative targeted energy savings (the sum of the annual energy savings target) for the same period. This is due to the way in which deemed activities are accounted for (for example, a deemed activity generates certificates in year 1 but has an effective life of a number of years).

7 In present value terms (2010) assuming a discount rate of 6 per cent.

8 In present value terms (2010) assuming a discount rate of 6 per cent.

APPENDIX G Public benefits charge

This report notes a range of areas where an upfront investment in energy efficiency would be expected to yield substantial improvements in economic outcomes, greenhouse gas abatement, energy security, and community and social benefits.

If implemented, an energy savings initiative would provide a financial incentive for energy efficiency improvements across the economy.

However, the other foundation measures canvassed in the report—improved governance; better innovation, data and analysis; and building an energy efficiency culture—would require separate funding over time.

The range of supporting measures outlined in Part 3 of the report would also require funding to implement; although again there is no sense that they should all be considered on the same timeline.

The normal funding channel for government measures is from consolidated revenue, allocated through the budget process. This ensures that all measures are considered using the same yardstick, so that those with the maximum benefit to Australians' wellbeing receive funding.

Importantly, any energy efficiency measures to be delivered by the Government would need to reflect the Government's fiscal position and priorities in coming years.

Depending on the priority placed on action, an alternative funding option could be considered, such as imposing a small charge on Australian energy use, with revenues hypothecated to energy efficiency priority areas. Such a charge could be used either as a source of long-term funding for a range of options in this report, or as an alternative to an energy savings initiative.

The public benefits arising from such a charge (in terms of economic benefits, climate benefits, energy security benefits, and community and social benefits) would be expected to outweigh the increased energy costs for Australian consumers. Importantly, as identified in the modelling for a possible energy savings initiative, any reduction in energy demand as a result of such a charge should result in lower ongoing energy generation and distribution costs, which would have the countervailing effect of actually reducing energy costs. Obviously, any decision to introduce a public benefits charge, particularly as an alternative to an energy savings initiative, would require careful consideration.

This appendix sketches out a few of the issues that would require further investigation if the Government were to explore the introduction of a public benefits charge.

Design options for a public benefits charge

Collecting revenues

A small price per unit charge could be applied to electricity use, or across a range of energy sources, such as electricity, gas, petrol, coke and diesel. A broader base would obviously allow for a lower rate, and would be less distortionary in terms of energy consumption decisions.

The point of obligation for a public benefits charge could be either primary energy or final energy. In terms of minimising complexity, a charge on primary energy (imposing the charge on electricity generators and upstream domestic gas and fuel suppliers, possibly with a carve-out for smaller generators) could be preferable. It would be important to consider, in this case, the interactions with the existing excise system. Alternatively, the point of obligation could be energy distributors or energy retailers.

If desired, it would be possible to vary the price per unit charge to account for the greenhouse gas emissions content of the energy source.

Distributing revenues

There are various ways in which revenues from a public benefits charge could be distributed. Two options are:

- an energy efficiency fund
- direct funding for energy efficiency measures.

Energy efficiency fund

Revenue from the charge could be used to build an energy efficiency fund. A range of approaches to using the fund could be envisaged, including competitive tendering or grant processes targeted at areas where market failures were evidently preventing energy efficiency improvements.

A public benefits charge in combination with an energy efficiency fund could potentially achieve the same broad outcomes as an energy savings initiative (see chapter 4), although it would require very careful design to achieve this.

To ensure cost-effective abatement, the abatement cost of energy efficiency delivered through a fund would also need to be capped at the international price of abatement.

There are various options as to who might be eligible for support under such a fund, and further detailed consideration would be needed to determine the program guidelines.

One option could be to target a proportion of the fund specifically to accredited energy service companies, thus encouraging the growth of Australia's energy services market (see chapter 13). Energy retailers, with their existing high level of contact with energy users, might wish to seek accreditation as energy service companies under such a model.

Alternatively, access to the fund could be extended more broadly. Large energy users (including energy generators) that wanted to significantly improve their energy efficiency from business-as-usual levels could bid for support under the fund. Distribution and transmission service providers might also be logical fund applicants, given their concordant requirement to manage energy demand within constrained networks.

As with an energy savings initiative, there would need to be a clear understanding of what energy efficiency improvements were and were not eligible for support

under the fund. Vigorous audit and verification procedures would also be required, along with appropriate penalties if outcomes were not delivered.

The default position would be to direct any revenues raised from a public benefits charge into general revenue (and this would be the only option if the charge were levied using the Commonwealth's taxation power). A long-term commitment to an energy efficiency fund could then be expressed through normal budget processes. This would allow for easier reallocation of funding between years, should the funding profile of the fund not align with the profile of revenues from the public benefits charge.

Direct funding for energy efficiency measures

Alternatively, a public benefits charge could provide funding for long-term energy efficiency priority areas, such as a new governance process, building an energy efficiency culture, or data, analysis and innovation. Or it could provide a funding stream for a range of the other key sectoral options canvassed in this report. These measures are variously flagged in the chapters that comprise Part 3 of this report.

If revenue from a public benefits charge were allocated to specific policy measures, rather than through a competitive process, it would be important to clearly justify why the measures chosen provide the greatest improvement in wellbeing for Australian energy users.

Transitional and distributional arrangements

Depending on the design parameters chosen, a public benefits charge could be relatively simple to implement, and to phase out when there is a mature carbon price. The arrangements for an energy efficiency fund might take longer to finalise, particularly in terms of what energy efficiency improvements would be eligible for support.

Depending on the level of a public benefits charge (and the resultant net impact on energy prices), it might be necessary to make particular provisions for different groups within society. Low-income households spend a greater proportion of their income on energy than higher-income households, and may be less able to actively manage their energy use. If desired, vulnerable energy users could be exempted from paying any public benefits charge. A large enough impost on energy prices might also decrease the international competitiveness of trade-exposed industries that use energy intensively in production.

Existing precedents for a public benefits charge

There are a number of precedents for a public benefits charge of this nature.

From 1996, the State of California has required all publicly owned electric utilities to establish a charge for programs that would benefit the public. This 'public goods charge' is US$0.263 per kilowatt hour. A surcharge on natural gas was introduced in 2001. The funds are used to support programs in energy efficiency, low-income assistance, renewable resources, and research, development and demonstration.[1]

In 1998, Brazil implemented a mandatory wire charge of 1 per cent of annual net revenues to be used, primarily by the utilities themselves, for public benefit investment. In 2007, the Brazilian congress passed a law stating that half of the total revenues generated through the wire charge must be spent on energy efficiency, half of which must be spent on energy efficiency measures targeted at low-income households.[2]

The main source of funding for the NSW Climate Change Fund is annual contributions from electricity distribution network service providers and from water utilities. In 2008–09, total contributions from these utilities were close to $89 million. The fund provides support to a range of climate change programs, including the $150 million NSW Energy Efficiency Strategy. The pass-through of these costs to customers in the form of higher electricity and water prices is not transparent in customers' bills.[3]

New Zealand currently has a levy on wholesale electricity purchasers that funds a suite of electricity efficiency programs administered by the Electricity Commission. Legislation currently before the New Zealand Parliament would see future delivery of these programs being undertaken by the Energy Efficiency and Conservation Authority. New levy regulations are being developed to reflect the new arrangements.

The proposed levy for energy efficiency will also be on all wholesale purchasers including retailers, meaning that ultimately the programs are paid for by every electricity consumer. The quid pro quo is that investment in cost-effective programs benefits all consumers by providing better economic return than expenditure on more expensive new generation and transmission assets. The programs also contribute to New Zealand's wider environmental goals.

The programs provide information and incentives for firms and households such as online information about efficient lighting options and funding for energy audits and the capital cost of some products and plant. Funding is tied to verified energy savings which are contractually guaranteed by service providers.

Public benefits charge as an alternative or adjunct to an energy savings initiative

A public benefits charge in combination with an energy efficiency fund should be able to achieve the same broad outcomes as an energy savings initiative. Unlike an energy savings initiative, though, the cost to the economy of a public benefits charge would be capped by the amount of the charge.

However, a public benefits charge would not be able to regulate the level of reduction in energy use with the same degree of precision.

The principles for cost-effective energy efficiency interventions set out in chapter 2 can be used to help guide the decision between a national energy savings initiative and a public benefits charge.

An alternative model would be to use the funds raised from a public benefits charge to extend an energy savings initiative. Obligated parties who achieved greater than their annual energy reduction target could be rewarded with an additional payment proportional to their level of overachievement. There would need to be a cap on annual payments to ensure that they did not exceed revenues from the charge.

The interaction with banking of overachievements would need to be considered. Any payment could be in lieu of banking, so that overachievements in energy reductions were effectively removed from the market each year. This would result in energy reductions above the level of the target. Alternatively, the payments could apply on banked energy reductions, which would mean that the target was not exceeded across the period of an energy savings initiative, but energy reductions were brought forward to an earlier period.

Obligated parties would have the option of accruing the additional payments themselves, or passing them through as lower bills to energy end users. The choice would depend on the point of obligation, given that network service providers have regulated revenues while energy retailers face a competitive market.

Economic impacts of a public benefits charge (initial estimates, without full modelling)

Tables G.1 and G.2 provide initial estimates of the impact of a public benefits charge; further modelling would need to be done to understand the ramifications of such an approach.

Table G.1 Direct annual costs of a public benefits charge

	Point of obligation		
Annual revenue raised	Primary energy ($/PJ)[a]	Final energy ($/PJ)[b]	Final electricity ($/PJ)[c]
$150 million	2,599	4,018	16,199
$300 million	5,198	8,036	32,397
$450 million	7,796	12,055	48,596
$600 million	10,395	16,073	64,795

Sources:

a. ABARE, Australian energy statistics, 2010. Primary energy consumption in Australia in 2007–08 = 5,772 PJ; residential = 426 PJ.

b. ABARE Australian energy projections to 2029–30, 2010. Final energy consumption in Australia in 2007–08 = 3,733 PJ; residential = 418 PJ.

c. ABARE, Australian energy statistics, 2010. Australian consumption of electricity in 2007–08 = 926 PJ; residential = 209.5 PJ.

Table G.2 Direct annual cost of a public benefits charge per household

	Point of obligation		
Annual revenue raised	Primary energy ($/household)	Final energy ($/household)	Final electricity ($/household)
$150 million	0.14	0.21	0.42
$300 million	0.28	0.42	0.85
$450 million	0.42	0.63	1.27
$600 million	0.55	0.84	1.70

Source: Australian Bureau of Statistics, Household and family projections, Australia, 2006 to 2031, 2010. Average projected number of Australian households in 2007–08 = 8.0 million.

Note: These costs only incorporate the direct impact on energy bills of a public benefits charge. They do not incorporate the increased costs of goods and services as a result on higher energy costs. The final cost per household from levying a charge on primary energy would be largely similar to the cost per household of levying a charge on final energy if energy generators passed through all costs to energy end users.

These figures also do not take into account the reduction in energy costs from business as usual that would result if energy efficiency improvements decreased the requirement for new energy generation and distribution costs. Further modelling would be required to get a clearer understanding of actual economic impacts.

Notes

1 California Public Utilities Commission, www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EE+General+Info/ee_funding.htm.

2 Renewable Energy and Energy Efficiency Partnership, Case study: Brazil's public benefit wire-charge mechanism—Fuelling energy conservation, www.reeep.org/file_upload/2785_tmpphpC9wvEx.pdf.

3 NSW Department of Environment, Climate Change and Water, www.environment.nsw.gov.au/grants/ccfund.htm.

APPENDIX H Cogeneration, trigeneration and waste heat recovery

Cogeneration is the combined production of electricity and useful heat, with system efficiency rates as high as 80 per cent (compared to an average 40 per cent for new coal-fired power plants).[1] Trigeneration is a cogeneration unit with an additional device to produce cooling. Waste heat recovery is the capture and re-use of heat, often directly in production processes.

The recent ClimateWorks Australia report *Low carbon growth plan for Australia* suggested that if Australia's industrial cogeneration potential was further exploited, it could abate 4–5 megatonnes of carbon dioxide equivalent emissions in 2020 and provide a net financial benefit to society (cogeneration can also be deployed in many commercial buildings).[2]

The Renewable Energy Target provides incentives for renewable cogeneration only (essentially biomass-fuelled cogeneration). There are no existing incentives that apply to natural gas cogeneration, which is the fuel most commonly used.

The deployment of cogeneration and trigeneration has to date been relatively limited in Australia.[3] The National Strategy on Energy Efficiency (measure 1.1.3) aims to improve take-up by identifying barriers and developing strategies to address them.[4]

Measures proposed in this report will also provide solutions to the regulatory, financial and cultural issues currently hindering these technologies.

The current National Energy Market rules create barriers to the deployment of distributed generation, and these are cited as the major barrier to cogeneration in Australia. Grid connection negotiations are often lengthy, costly and complex, and pricing structures do not always reflect, in a transparent manner, the contribution of distributed generation. Suggested improvements to the National Electricity Market (streamlined connection processes and standardised connection arrangements, for instance) would simplify, shorten and reduce the cost of connection processes for cogeneration and trigeneration. Work currently being undertaken by the Ministerial Council on Energy and the Australian Energy Market Commission also seeks to address these barriers. (See chapter 12.)

Beyond this, however, other barriers can include initially high capital costs for cogeneration or trigeneration units, the unavailability of natural gas in some markets, and costs associated with approvals processes (including air-quality concerns in urban airsheds such as central business districts). Together, these factors can contribute to low or uncertain internal rates of return while discouraging potential investors from accepting what can appear to be excessive cost and risk. Responding to some of these barriers (for example, natural gas availability) is beyond the mandate of the

Task Group, but others are addressed in recommendations in a number of areas. (See chapters 4 and 8.)

A national aspirational energy efficiency target and a national energy savings initiative would provide momentum and additional sources of funding to capture the energy efficiency gains that cogeneration, trigeneration and waste heat recovery can achieve. Expanding the Energy Efficiency Opportunities program to generators and greenfield projects would also help industrial cogeneration and recovery of waste heat. (See chapters 4 and 8.)

Information and applications within the energy efficiency measurement and analysis platform (EE-MAP) would help identify locations where cogeneration is likely to be feasible in terms of land use mix and possible network benefits. (See chapter 6.)

Finally, cultural resistance, prioritisation of core business initiatives and, as a result, lack of project precedents and qualified skills adversely affect ventures into these new technologies. This issue could be overcome through pilot projects that would demonstrate the technical feasibility, reliability and long-term benefits of cogeneration, trigeneration and waste heat recovery. (See chapters 11, 13 and 15.)

Notes

1 CSIRO, *Intelligent grid*, 2009; International Energy Agency, *Coal-fired power generation*, 2009.

2 ClimateWorks, *Low carbon growth plan for Australia,* 2010, p. 88.

3 Only 2.5 gigawatts of electricity came from cogeneration in 2006. As a reference, total electricity production equated to 47 gigawatts from 2006–07. CSIRO, *Intelligent grid*, 2009; ABARE, *Energy in Australia,* 2010.

4 On this matter, a national workshop on cogeneration and trigeneration was held in Sydney on 23 June 2010.

Improving energy efficiency across the public sector not only delivers savings to taxpayers from lower costs of government operations, but also enables governments to leverage their considerable market power to drive market transformation. This is particularly the case during times when support for emerging market players is crucial. Governments around the world have played a role in establishing an energy efficiency culture. As noted by ClimateWorks Australia, taking a lead role has been shown to be a very effective means of raising awareness and building commitment for improving energy efficiency.[1]

Current government action on energy efficiency

A number of measures are underway to improve energy efficiency across Australian Government operations. These include the Energy Efficiency in Government Operations (EEGO) policy, the National Strategy on Energy Efficiency and the ICT Sustainability Plan.

Energy Efficiency in Government Operations: Since the introduction of the revised EEGO policy in 2006, government agencies have progressively improved the energy efficiency of their operations. This has largely been achieved through annual energy efficiency (or energy intensity) reporting[2] and minimum efficiency requirements for buildings targeted at agency level.[3] In the building categories, energy intensity for tenant light and power and central services has decreased by 6 per cent and 4 per cent respectively since 2006–07.[4] Overall, energy intensity in the passenger vehicles category under EEGO has decreased by 4 per cent since 2006–07.[5]

Despite these improvements, buildings and transport continue to represent opportunities for further improvement in the energy efficiency of Australian Government operations.

Office buildings are the largest source of emissions for the Australian Government sector, at 36.5 per cent of total government CO_2-e emissions. The Australian Government occupies approximately 15 per cent of the commercial property market, with 90 per cent of this property leased from private sector companies. Passenger vehicles account for approximately 11 per cent of the Australian Government's total (non-Defence) energy consumption.[6]

National Strategy on Energy Efficiency: The National Strategy on Energy Efficiency recognises that governments are significant users of energy in the community. Under measures developed under the National Strategy to improve energy efficiency across all government operations, governments are to:

- significantly improve the environmental performance of the buildings they own or occupy
- reduce travel relating to government business and its related greenhouse gas emissions
- place greater emphasis on energy efficiency as part of broader improvements to their sustainable procurement practices.

Work programs under these measures are also underway across jurisdictions. Progress reports on the improvements in environmental performance of buildings are scheduled to be provided to the National Strategy's senior officials group in 2011, with the Ministerial Council on Energy and the Australian Procurement and Construction Ministerial Council jointly developing a green lease policy framework for implementation by individual governments in 2010–11.

ICT Sustainability Plan: This plan is under development and will address recommendations made under the review of the Australian Government's use of information and communications technology (the Gershon Review).[7]

Other potential areas for further government action

This report has identified further potential opportunities for government action, both as a demonstration to the private sector and for the direct contribution this can make to improve the energy efficiency of public sector facilities and Australian Government operations.

The potential for energy efficiency improvements across community facilities is explored in chapter 13 as a possible investment priority. Such an activity could provide for needed energy efficiency upgrades in community buildings and help demonstrate the cost efficiency of technologies such as cogeneration, as well as provide some capacity to stimulate the growth and experience in the energy service market.

Government procurement, discussed in chapter 14, considers the costs and benefits of mandating procurement of high-energy-performing equipment where it is available and is assessed as value for money on a whole-of-life basis.

The merits of further strengthening the targets for the categories 'tenant light and power' and 'office central services' at the portfolio level for government buildings, as part of upgrading the EEGO policy, are discussed in chapter 13.

Chapter 9 explores the benefits of a mandatory light vehicle emissions standard for the Commonwealth passenger vehicle fleet.

Additional opportunities for improving energy efficiency within government operations

The EEGO policy is scheduled for renewal in 2011. The measures with implications for Australian Government operations outlined here could be considered as part of an upgraded EEGO policy, as could additional measures for improving energy efficiency in Defence establishments and computer centres.

Defence establishments: Under the current EEGO policy, the Department of Defence is rolling out metering in its establishments in order to better monitor energy use.[8] By analysing the data captured through the new metering system, further improved targets for Defence establishments may be possible; this could be explored with the Department of Defence as part of an upgraded EEGO policy.

Computer centres: The development of a data centre rating tool is progressing in accordance with requirements under the current EEGO policy. The tool is scheduled for completion in late 2010 and is expected to enable the creation of energy efficiency targets for the Australian Government's data centres and their associated equipment.

All proposals for government action should be subject to rigorous cost–benefit analysis and would need to take account of the fiscal situation, noting that different proposals may be better suited for phased introduction or conducted initially as pilot programs.

Notes

1 ClimateWorks Australia, *Low carbon growth plan for Australia*, 2010.

2 Department of the Environment, Water, Heritage and the Arts (DEWHA), *Energy use in the Australian Government's operations 2007–08*, 2009.

3 Commonwealth of Australia, *Energy Efficiency in Government Operations (EEGO) Policy*, 2006.

4 DEWHA, 2009.

5 DEWHA , 2009.

6 DEWHA , 2009.

7 Department of Finance and Deregulation, *Review of the Australian Government's use of information and communications technology*, 2008.

8 Commonwealth of Australia, 2006.

APPENDIX J Local government

Around 560 local government bodies in Australia provide services to a diverse range of metropolitan, regional, rural, and Indigenous communities. The population and geographic size of councils differ greatly. The largest local government authority by population is the Brisbane City Council, with 970,000 residents. The average council population is 28,400.

Local councils spend more than $20 billion each year on providing an increasingly broad range of infrastructure, economic and community services to residents. In total, councils employ around 178,000 people (almost 10 per cent of the total public sector).

Constitutional responsibility for local government lies with the state and territory governments. Consequently, the roles and responsibilities of local government differ from state to state. Functions include:

- infrastructure and property services, including local roads, bridges, footpaths, drainage, and waste collection and management
- provision of recreational facilities, such as parks, sports fields and stadiums, golf courses, swimming pools, sports centres, halls, camping grounds and caravan parks
- health services, such as water and food inspection, immunisation services, toilet facilities, noise control, meat inspection and animal control
- community services, such as child care, aged care and accommodation, community care, and welfare services
- building services, including inspections, licensing, certification and enforcement
- planning and development approval
- administration of facilities, such as airports and aerodromes, ports and marinas, cemeteries, parking facilities and street parking
- cultural facilities and services, such as libraries, art galleries and museums
- water and sewerage services (in some states).

Many Australian local governments have been extremely proactive in addressing issues of energy efficiency, climate change and sustainability for their residents. Some councils have committed to carbon-neutral targets, while others have energy savings action plans in place. A number of councils have either invested in renewable energy, or have developed community energy-buying programs, allowing their communities to buy green energy at a cheaper rate. Numerous councils are also undertaking demonstration low-energy housing projects.

The local government challenge

Local councils will be a critical component of a step-change improvement in Australia's energy efficiency. Councils contribute to improvement in energy efficiency in a multitude of ways (depending on their size and the characteristics of their local government area):

- advocacy and leadership about the importance of energy efficiency
- education products for householders, small and medium enterprises, community groups and schools
- information on and promotion of Australian Government and state subsidies and rebates
- local delivery of national and state energy efficiency programs
- engaging with the local community on energy efficiency by providing local contacts and a known face, as well as consistency of messaging over time
- facilitation of information sharing between energy efficiency providers and consumers
- demonstration of energy-efficient technologies and activities (including renewable energy and energy-efficient municipal buildings and transport options)
- transport and land-use planning so that people can spend less time and energy on travel
- encouraging innovative financing models for energy efficiency.

Options for supporting local governments

A number of options in this report would benefit local councils in their efforts to improve energy efficiency.

- The Smart City transport proposal could fund capital or large regional cities to reduce private car and light commercial travel through an integrated package based on the successful TravelSmart model.
- COAG could examine the potential benefits and costs of introducing variable congestion pricing on existing toll roads, and of extending it to heavily congested parts of the road network.
- Supporting locally led or delivered activities would be a core component of building an energy efficiency culture and local governments are well placed to engage in or lead these projects. 'Building an energy efficiency culture' should support a diverse range of local approaches (including innovative trials) and ensure that successes are shared and built upon around the country. The Australian Government could provide targeted grants, supporting materials and services and cross promotion, as well as a communication forum to engage with local facilitators and leaders to share and expand on best practice. Visible acknowledgment and awards for energy efficiency leaders, a one-stop shop for reliable help on energy efficiency actions and government rebates, and clear and accessible information on energy and on which energy-efficient products to buy, would all become available in time. Local councils would be critical in providing consistent messaging to energy end-users.
- Local councils would benefit from the development of the energy efficiency measurement and analysis platform (EE-MAP) by being able to easily access energy efficiency information about their region (such as potentially benchmarking their energy use against other areas or identifying where local electricity network constraints could be reduced through energy efficiency).
- Local councils would be important stakeholders in the development of the pathway towards zero-emissions buildings.
- Local councils could be consortia members in bidding for grants under an energy-efficient hubs initiative, and would be instrumental in their delivery (including possible trials of innovative financing initiatives and in local planning approvals where necessary). An energy-efficient hubs initiative would allow local councils to show leadership in hosting leading high-tech products, solutions and companies.
- Development of an Australian energy services sector would help local governments to make energy efficiency improvements to municipal buildings.
- A revolving financing mechanism that supports building energy efficiency improvements across community facilities would provide funding for demonstrating energy efficiency improvements across public sector buildings such as hospitals and aged care facilities.
- Expansion of the Energy Efficiency Opportunities program should improve the energy efficiency of gas and electricity generators and networks, reducing costs for energy consumers including local governments and community groups.

Were the Government attracted to these proposals, they would complement measures in the National Strategy on Energy Efficiency (such as showcasing and promoting energy efficiency technologies and energy conservation measures; and increasing the energy efficiency of street lighting), resulting in a more comprehensive approach to energy efficiency improvement at local government level.

APPENDIX K Including an energy efficiency target in the National Energy Market framework

There are at least two ways in which a national energy efficiency target could be included in the National Energy Market framework to guide the Australian Energy Market Commission (AEMC) and/or the Australian Energy Regulator (AER) in decision-making: by directly applying principles in the key legislation (for instance, the National Electricity Law), or through a statement of policy principles. Both would require consensus agreement of the Ministerial Council on Energy (MCE). Changes to the National Electricity Law would also require passage through the South Australian Parliament.

Examples of each method are provided below, to highlight how they may apply without overriding the National Electricity Objective. Note, however, that these are purely illustrative and without prejudice.

Illustrative example of a principle in the National Electricity Law

XXX Manner in which AER performs AER regulatory functions or powers

The AER must, in performing or exercising an AER regulatory function or power, perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the National Electricity Objective and, where relevant, in a manner that is compatible with the achievement of the national energy efficiency target, including through the removal of barriers to energy efficiency and the provision of cost-effective incentives for all market participants to undertake energy efficiency activities.

XXX Application of national energy objective

(1) The AEMC may only make a Rule if it is satisfied that the Rule will or is likely to contribute to the achievement of the National Electricity Objective.

(2) For the purposes of subsection (1)—

(a) the AEMC may give such weight to any aspect of the national energy objective as it considers appropriate in all the circumstances;

(b) where relevant, the AEMC must satisfy itself that the Rule is compatible with the achievement of the national energy efficiency target, including through the removal of barriers to energy efficiency and the provision of cost-effective incentives for all market participants to undertake energy efficiency activities;

(c) the AEMC must have regard to any relevant MCE statement of policy principles.

Illustrative example of a statement of policy principles

Ministerial Council on Energy Statement of Policy Principles

The Ministerial Council on Energy recognises that:

a. addressing increasing energy demand without a step change in energy efficiency would require significant investment in energy infrastructure and increase the costs of Australia's long-term transition to a low-carbon economy;

b. energy efficiency opportunities of either long-term benefit to Australia or short-term benefit to market players are not being taken up;

c. the [Council of Australian Governments] has agreed to the following long-term goals with respect to energy efficiency:

[insert the target as defined—for example, a target of reducing Australia's primary energy intensity by 30 per cent from 2010 to 2020]

and accordingly makes the following Statement of Policy Principles consistent with the National Electricity Objective:

1. The national electricity market should:
   a. develop in a manner that both supports government policy and regulatory intervention for energy efficiency and remains consistent with the National Electricity Objective;
   b. not create or maintain regulatory barriers to the take-up of energy efficiency opportunities;
   c. include incentive arrangements that promote cost-effective energy efficiency and the cost-effective reduction of network losses.
2. Further to the above principle, the regulation of network services should promote energy-efficient outcomes for networks, their users and end users.
3. For the purpose of this statement, energy efficiency includes demand-side response and reductions in peak energy demand, greater efficiency in the generation and delivery of energy, distributed and embedded generation, displacement and substitution of energy through mechanisms such as cogeneration, and reduced demand for energy generally.

APPENDIX L Considerations in designing a national energy savings initiative

Bertoldi and Rezessy (among others) identify five elements that are fundamental to any energy efficiency obligation:

- creating and framing demand
- certificates for units of energy efficiency and rules for trading
- enabling measures (measurement and verification, evaluation methods, rules for issuing certificates, data management and tracking)
- cost recovery
- enforcement and sanctions.[1]

This appendix outlines the issues to be considered in developing an energy savings initiative, using these five elements as a framework. In summary, creating and framing demand requires consideration of the system used, targets, eligible fuels and obligation points. Certificates and rules for trading require consideration of coverage and of special treatment for particular groups. The only enabling measures considered here are evaluation methods and rules for issuing certificates (including consideration of greenfield sites), as the others are administrative in nature. Cost recovery is not discussed. Analysis of enforcement is limited to the types of penalties that might apply.

Creating and framing demand

A baseline-and-credit framework

Market instruments are often characterised as either cap-and-trade or baseline-and-credit. In a cap-and-trade scheme, the Government imposes a cap on the commodity it wants to control (in this case energy use) and issues permits equivalent to units of the cap. People who wish to use the commodity must purchase and surrender a permit.

In a baseline-and-credit scheme, the Government defines a baseline for the commodity it wants to control (in this case energy use), and issues credits for activities that improve the baseline. Entities that are required to meet the baseline can purchase these credits to comply. In a paper analysing (among other things) forms for energy efficiency obligations, Eyre notes:

> There is a fundamental difference in objectives between 'baseline-and-credit' and 'cap-and-trade' options—the former seeks to improve energy efficiency, the latter reduces energy demand through either or both of improved efficiency and reduced demand for energy services.[2]

The concept of energy efficiency involves comparing actual energy performance to a counterfactual informed by historical experience. That is, to measure energy efficiency improvements arising from a specific action, a projection based on energy consumption prior to taking the action would be compared to the amount of energy actually consumed after the action was taken. This means that baseline-and-credit frameworks are typically selected as the most practical form for energy efficiency obligations.

The United Kingdom's Carbon Reduction Commitment Energy Efficiency Scheme is a cap-and-trade hybrid of an energy efficiency obligation and an emissions trading scheme that operates alongside the European Union's emissions trading scheme and the UK Carbon Emissions Reduction Target (discussed in chapter 4). Participation is based on energy consumption, and participants are required to monitor and report on their energy use, but must purchase and surrender permits for carbon emissions from the energy used.

Given that an energy savings initiative would have the objective of making the use of energy more efficient across the economy, a baseline-and-credit structure appears more appropriate.

A baseline could be set for the whole economy, or sector by sector. Setting a sector-by-sector baseline would prevent some portion of the overall obligation from moving towards least-cost opportunities, and therefore would be unlikely to deliver energy efficiency improvements at least cost. To ensure least-cost energy efficiency improvements are leveraged, a single, economy-wide baseline should be used.

Setting an obligation

To create a meaningful relationship between the cost of compliance and actual energy use, it seems appropriate to measure the obligation for an energy savings initiative against final energy—that is, energy consumed by end users — with the obligation measured in units of energy.

As the proposed key mechanism to achieve the aim of placing Australia at the forefront of the OECD for energy efficiency improvement, the level of ambition of the obligation would be crucial. Mundaca et al., in their study of market behaviour in mandatory energy efficiency schemes, note that 'the integrity and effectiveness of a mandatory energy-saving target relies critically on how ambitious the target is'.[3]

Setting an obligation also requires consideration of which fuels that make up final energy should be included. Including all fuels in the obligation would make it more comprehensive and would open up a greater range of least-cost energy efficiency opportunities, but it would also make the obligation more complex. Limiting the range of fuels would reduce complexity, but also limit the scope of activities that could create credits.

Setting a trajectory for the obligation in advance would provide certainty. However, as the timeframe for an energy savings initiative might be uncertain, as could be the form of an eventual carbon price, the Government might wish to maintain some ability to adjust the size of the obligations to changing circumstances. For instance, the trajectory might be set for an initial period, say three years, with an indicative, non-binding trajectory beyond that.

The trajectory could be set as a series of absolute annual amounts or as percentages to be achieved against the previous year's final energy contribution from included fuels. Annual amounts would provide more certainty, but if energy use in the future changed significantly from projected levels, an absolute amount could be too small or too large to achieve the desired outcomes. A percentage trajectory would automatically adjust energy efficiency achievement against underlying growth or reduction in demand.

The trajectory for an energy savings initiative could be determined by a number of factors:

- Australia's 2020 emissions reduction target and/or energy efficiency target
- the contribution that the energy sector is expected to make to meeting the 2020 emissions reduction target
- the estimate of the overall energy efficiency improvement required to place Australia at the forefront of OECD performance, and the fraction of this expected to be achieved through the National Strategy on Energy Efficiency, other step-change measures and cultural change
- the amount of potential energy efficiency improvement that could be brought forward and at what cost and benefit to the economy
- expected energy growth during the same time period, noting that energy growth is largely a function of population and GDP
- the fiscal and economy-wide costs of an obligation, including likely impacts on low-income households, community organisations and large energy users.

Choosing an obligation point

The obligation has to be placed somewhere in the energy supply chain. Provided that credits can be created at any point in the chain and prices are free to adjust in response to the cost of energy efficiency activities, the choice of obligation point matters little in a strict economic sense. But different obligation points could affect the complexity and cost of a scheme. If an energy savings initiative is to leverage the full range of possibilities for energy efficiency, it makes sense to place the point of obligation as close as possible to the people who have the most control over the end use of energy. But placing the obligation on end consumers themselves is complex and costly — put simply, there are so many consumers that sensible operation of an energy savings initiative would be impossible.

Electricity and gas retailers provide a way of aggregating small and medium consumers, both households and businesses, to create a workable obligation point. Most would also be complying with at least one, and possibly more than one, state-based scheme, so a national energy efficiency obligation that replaced the state-based schemes would not change, and could even reduce, regulatory burden. A threshold for a minimum number of customers could be set to ensure that new market entrants are not disadvantaged.

Another option might be to place an obligation on electricity and gas distributors. This would have the advantage of measuring and achieving reductions on a regional scale. However, because distributors are monopolies, in one respect they have less motivation to minimise costs as higher costs will not result in their losing customers. However, they could also benefit directly from improving energy efficiency in their distribution areas because this would delay or defer the need to invest in infrastructure upgrades.

Many large users of energy do not buy energy from an energy retailer, instead taking it directly from the national electricity or gas market, or generating it themselves. Excluding these loads from the obligation quantum would mean either excluding the loads' owners from creating credits (a potentially significant source of energy efficiency opportunities, the exclusion of which could result in a greater cost the economy) or effectively creating a form of offsets, which would increase complexity in setting and achieving an obligation.

Including large energy users would allow them to choose between reducing energy in their own operations and contracting someone else to reduce energy elsewhere on their behalf if that is more cost effective for them. These issues are discussed further in chapter 4.

The choice of eligible fuels would also affect the obligation point. The more fuels that are included, the more potential obligation points are available. The point at which other regulatory obligations are imposed would also need to be considered.

Certificates and rules for trading

One of the most visible differences between existing energy efficiency obligations is whether they include a tradeable certificate or not. Trading is often discussed in the context of improving economic efficiency, and this is considered further in Box L.1.

Regardless of whether a tradeable certificate is created for an energy savings initiative, there would still be financial transactions between those undertaking activities (energy service companies, individuals and businesses) and those who need to meet the obligation; and these financial transactions would be linked to amounts of energy-efficient activity. In other words, those who need to meet the obligation are likely to pay others for the right to 'own' the credit for energy-efficient activity, meaning that an energy savings initiative would inevitably give rise to at least a secondary market in energy-efficient activity. Certificates may help to reduce participants' exposure to risk in this secondary market by providing more assurance about what qualifies as valid activity.

The decision to include or exclude a tradeable certificate will depend on the extent to which it contributes to or detracts from achieving the design principles outlined in Table 4.3 in chapter 4.

Box L.1 Trading and efficiency

Tradeable certificates are often characterised as maximising compliance flexibility, thereby ensuring that an obligation delivers least-cost energy efficiency. However, the simple presence of a tradeable certificate is not sufficient to guarantee that trading behaviour will emerge and capture these efficiencies.

Mundaca et al. note that 'an ambitious energy saving target is a key prerequisite' to encourage trading, 'driving a more dynamic behaviour'.[4] In an evaluation of the American cap-and-trade scheme for sulphur dioxide, Ellerman et al. identify other factors that are just as significant in influencing trading behaviour. These include competition for customers, market liquidity, trading platforms, transaction costs, the number and scope of potential cost-effective measures, additionality rules, banking, and familiarity of participants with trading markets.[5]

The efficiency benefits from trading would be realised if obligated parties faced materially different costs in undertaking activity themselves. A tradeable certificate would be most valuable if there were significant amounts of secondary trading among liable parties, arbitrage agents, energy service companies and people undertaking energy efficiency projects. Tradeable certificates would be expected to reduce transaction costs and increase confidence among secondary market participants.

Tradeable certificates would also provide a level of detail on energy efficiency marginal costs, provided that trades were conducted through a central exchange where the price was openly declared.

It does not always follow that the presence or absence of tradeable certificates will lead to trading and therefore to the capture of the benefits of trading. In France and the United Kingdom, Mundaca et al. suggest that if participants' corporate business strategies were aimed at increasing market competitiveness, they would not trade when given the opportunity, because by not trading they could increase their strategic knowledge of energy efficiency and be better placed to use this to increase their competitiveness.[6]

Evaluation methods and rules for issuing certificates

Additionality

To ensure that an energy savings initiative delivers energy efficiency above and beyond the expected business-as-usual improvement, additionality criteria need to be applied to potential sources of credit. Issues for consideration include:

- whether credit is awarded for projects that are undertaken to meet other regulatory requirements
- whether the project goes beyond the expected efficiency gain that would have happened through 'normal' technological improvement
- whether credit should be awarded for projects that were undertaken because another, larger incentive (such as a grant or a tax benefit) was available.

Deemed credit versus post facto credit

Many existing energy efficiency obligations have allowed 'deemed activity'. In these schemes, the regulator defines a list of activities that, if completed in the manner and form determined by the regulator, will be deemed to have achieved an amount of energy efficiency that can be credited towards an obligation. There is no baseline established for the individual site at which the activity takes place, nor is there measurement of the actual energy efficiency achieved once the activity has taken place. In these schemes there is therefore no observable link between the deemed activity carried out and the overall amount of energy consumed in the economy. Deeming provides a simple way of complying with the obligation and favours technologies where the value of credit is low compared to transaction costs. There are a variety of ways of arriving at deemed estimates, and some are more reliable than others.

Some existing schemes also use a more rigorous methodology for awarding credit. In this method, a historical baseline is established for a site or a project, and once new equipment is installed, credit is claimed post facto for energy reductions achieved against the historical baseline. Provided the baseline is rigorously established, this methodology delivers certainty that there is an observable link between energy efficiency credited towards the obligation and energy consumption in the economy. Post facto calculation favours technologies and projects where the value of credit is significant compared to transaction costs. It is also suitable for capturing non-technological measures such as behaviour change as it relies on observed data.

It would be possible to design an energy savings initiative that allowed for both these approaches. A question for future consideration would be the amount of (less quantifiable) deemed credit that should be allowed.

Greenfield sites

As a baseline-and-credit scheme, an energy savings initiative would compare energy efficiency improvements to past energy performance, and award credit for improvements that perform better. Investment would flow to existing industrial sites, homes and business premises rather than to greenfield sites where there is no baseline at the site to compare against. As part of further policy development, an assessment should be made of opportunities to use an energy savings initiative to provide incentives for new projects to go beyond minimum requirements or business-as-usual practices.

For example, the Building Code of Australia stipulates that all new homes should be designed to achieve a rating of six stars or equivalent. Some local government authorities may impose additional planning regulations for housing to achieve a rating beyond this. An energy savings initiative could create an incentive for property developers to go beyond compliance with the building code and/or planning consent conditions by creating a rule to award credit for homes that achieve more stars than the minimum requirement.

Penalties

Energy efficiency obligations are usually structured with a penalty per unit of the obligation that is not achieved. This has the effect of putting a 'ceiling' cost per unit of energy saved on the projects likely to be leveraged, because liable parties would sensibly opt to pay the penalty rather than pay more than the penalty for a unit of energy reduction.

Often a per-unit penalty is accompanied by a 'make-good' provision where the obligation not achieved has to be achieved in a following year or by purchasing energy reductions from elsewhere. This reflects that it is important to the regulator that the energy efficiency reaction represented by the obligation is actually achieved, and to some extent removes the 'ceiling' by making it less attractive to use the penalty instead of complying. However, if energy efficiency savings were genuinely unavailable at less than the penalty price, this may lead to a situation where the obligation drives energy efficiency at all costs, rather than at least cost.

Notes

1 P Bertoldi & S Rezessy, 'Tradeable white certificate schemes: Fundamental concepts', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 239.

2 N Eyre, 'Regulation of energy suppliers to save energy: Lessons from the UK debate', *Proceedings of the British Institute of Energy Economics Conference*, 2008, p. 2.

3 L Mundaca, L Neij, N Labanca, B Duplessis & L Pagliano, 'Market behaviour and the to-trade-or-not-to-trade dilemma in "tradeable white certificate" schemes', *Energy Efficiency*, vol. 1, no. 4, 2008, p. 344.

4 Mundaca et al., pp. 342, 343.

5 AD Ellerman, PL Joskow, R Schmalensee, JP Montero & EM Bailey, *Markets for clean air. The US acid rain program*, Cambridge University Press, quoted in Mundaca et al., p. 342.

6 Mundaca et al., p. 345.

APPENDIX M Tax incentives for green buildings — issues and alternatives

If the Government wanted to provide financial incentives to assist building energy efficiency improvements, in particular in commercial buildings, then such encouragement could be delivered through grants programs or the tax system. For example, tax incentives could take the form of 'green' depreciation or an investment allowance.

Competitive grants for energy efficiency

A competitive grants-based approach would provide a transparent mechanism to provide financial support for the owners of commercial buildings to invest in energy efficiency. The competitive nature of a grants process would be conducive to value-for-money investment by the Government, as proposals would have to meet predetermined selection criteria. Furthermore, a grants-based scheme would allow the Government to cap its funding commitment.

Chapter 11 put forward options for providing competitive funding support for innovation in district-scale energy efficiency solutions. An alternative could be to fund individual office (and/or non-residential) building upgrades (such as through extension of the Green Building Fund), however this approach would not be able to provide innovation support at the neighbourhood level.[1]

Tax incentives for energy efficiency in commercial buildings

The tax system could also be used to provide concessional treatment for capital expenditure incurred when improving the energy efficiency of an individual commercial building.

Australia's tax depreciation system allows an asset to be written off (that is, deducted from a taxpayer's assessable income) over its effective life. An asset's effective life is the period over which it can be used to produce income.

For capital works, such as buildings and structural improvements, taxpayers can claim an annual deduction of either 2.5 per cent (over 40 years) or 4 per cent (over 25 years) of construction expenditure. The rate depends on when construction started and how the capital works are used.

Green depreciation

Several submissions called for more generous depreciation arrangements (so-called 'green' depreciation) for expenditure that results in a significant improvement in the energy efficiency of the commercial building, or which brings the building's energy efficiency to a certain, high, level.

The effect of such accelerated depreciation would be to allow eligible taxpayers to claim larger deductions early in the life of an asset (lowering their taxable income in those years), with lower deductions (and higher taxable income) in the latter part of the asset's life. In nominal terms, the overall size of the deductions that could be claimed would be unchanged, but the deductions would be brought forward relative to the standard tax treatment. There would be a real cost to revenue because taxes would be collected later. This bringing-forward would effectively be an interest-free loan made by government to taxpayers, providing taxpayers with an additional incentive to invest in energy efficiency measures.

Box M.1 Designing factors for green depreciation

If the Government were inclined to pursue the option of green depreciation then a range of design factors would need careful consideration. Several of these factors were highlighted by the Property Council of Australia in its submission to the Task Group:

- the threshold for expenditure eligible for accelerated depreciation
- the depreciation rates which would apply to the eligible expenditure, covering both assets covered by the Uniform Capital Allowance regime (Division 40 of the *Income Tax Assessment Act 1997*) and capital works (Division 43 of the Act)
- a mechanism for verifying ongoing eligibility for the concessional tax treatment.

The time period over which qualifying expenditure could be incurred would also need to be considered.

In setting a qualifying threshold, there are a range of possible approaches. In its submission, the Property Council of Australia suggested that eligibility could be linked to retrofits which see the building attain a certain NABERS or Green Star rating, or made dependent on the building's carbon intensity being lower than a specified level, such as 100 kilograms CO_2-e per square metre per annum.

Setting a qualifying threshold would also involve trade-offs. The Property Council of Australia suggested that the threshold should differentiate between building types and climatic zones. While such an approach could assist in targeting a concession, it would also make any scheme more complex.

Adopting a stringent test, which limited eligibility only to major retrofits resulting in the building reaching a very high level of energy efficiency, would contain a scheme's cost and help to limit the extent to which building owners are subsidised for business-as-usual improvements. Such an approach would need to consider how to avoid providing funding for major retrofits which are currently required to meet building code energy efficiency levels. The implication of limiting eligibility is that fewer building owners would be expected to be eligible for the concession than if a less stringent threshold were applied.

A verification mechanism would need to be designed to determine whether a retrofit met the criteria for a tax concession and to ensure that concessions were only provided to legitimate projects. This would involve additional administrative costs.

Green investment allowance

Accelerated 'green' depreciation is not the only option for using the tax system to provide tax incentives for retrofits of commercial buildings to improve their energy efficiency. Rather than adjusting the rate at which capital expenditure is deductible, eligible taxpayers could be provided with a one-off bonus tax deduction—essentially a 'green' investment allowance. This would be analogous to the Small Business and General Business Tax Break, which formed part of the Government's Nation Building and Jobs Plan in response to the global financial crisis.

However, such investment allowances have typically been used as broad-based measures designed to support aggregate demand in the economy, rather than to provide incentives for specific types of capital expenditure. Selective investment incentives can also tend to push up the relative price of equipment that is eligible, which may have the adverse consequence of making energy efficiency improvements more costly for those not eligible for the incentive, such as those owning residential property.

Summary

Irrespective of the specific design of a concession, using the tax system to provide encouragement for particular behaviour generally involves some additional drawbacks relative to providing a similar incentive through an expenditure program. These include less transparency and less timely assistance for taxpayers, as the incentive is only received following the completion of their annual tax return. In contrast, direct grants programs usually involve more timely payments, depending on the design of the program. However, entrenching a concession in the tax law can potentially provide stakeholders with additional certainty.

Note

1 If a 'single building' grants program was taken forward it would be important to consider how to maximise the impact on the broader industry, possibly through incorporating robust information gathering, communication, and skills development elements. Expanding the eligibility criteria to include all non-residential buildings, rather than office buildings only, should also be considered. Currently, NABERS assessments are available for hotels and shopping centres, in addition to office buildings. It seems reasonable to expect that there are opportunities to improve energy efficiency in commercial buildings beyond those used as offices. Broadening the eligibility criteria is likely to result in more cost-effective energy efficiency improvements becoming eligible.

List of boxes, figures and tables

Boxes

Figures

Tables

Abbreviations and acronyms

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
APEC	Asia–Pacific Economic Cooperation
CCS	carbon capture and storage
CERT	Carbon Emissions Reduction Target (UK)
CO_2-e	carbon dioxide equivalent
COAG	Council of Australian Governments
CPRS	Carbon Pollution Reduction Scheme
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
DEWHA	Department of the Environment, Water, Heritage and the Arts
DRET	Department of Resources, Energy and Tourism
EEC	Energy Efficiency Commitment (UK)
EE-MAP	energy efficiency measurement and analysis platform
EITE	emissions-intensive trade-exposed
ESCO	energy service company
ESS	NSW Energy Savings Scheme
G8	Group of Eight; members are Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States
GDP	gross domestic product
GEMS	greenhouse and energy minimum standards
GGAS	Greenhouse Gas Reduction Scheme
GJ	gigajoule
GST	goods and services tax
GWh	gigawatt hour

HEPS	high energy performance standards
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kWh	kilowatt hour
MCE	Ministerial Council on Energy
MEPS	minimum energy performance standards
MJ	megajoule
Mt	megatonne
Mtoe	megatonne of oil equivalent
MWh	megawatt hour
NABERS	National Australian Built Environment Ratings System
NEM	National Electricity Market
NFEE	National Framework for Energy Efficiency
NGER Act	*National Greenhouse and Energy Reporting Act 2007*
NSEE	National Strategy on Energy Efficiency
OECD	Organisation for Economic Co-operation and Development
PACE	property assessed clean energy (financing)
PJ	petajoule
ppm	parts per million
RD&D	research, development and demonstration
REES	Residential Energy Efficiency Scheme (South Australia)
RET	Renewable Energy Target
TWh	terawatt hour
UNFCCC	United Nations Framework Convention on Climate Change

Glossary

abatement	Activity that leads to a reduction in the level of greenhouse gas emissions.
additionality	Pertaining to projects or activities that achieve 'additional' reductions in energy use compared with estimated 'business as usual'.
alternative energy	Energy derived from non-conventional sources, particularly renewable sources.
banking	The ability of obligated parties to use credits issued or created in one compliance period in a future compliance period under an energy efficiency obligation scheme. Banking allows obligated parties to better manage annual variations in their energy use profiles. These variations may arise, for example, due to cyclical economic activity or disruptions to production.
baseline	A projected level of future emissions or energy use against which reductions by project activities could be determined; or the emissions or energy use that would occur without policy intervention.
baseline-and-credit system	In a baseline-and-credit scheme, the Government defines a baseline for the commodity it wants to control (in this case energy use), and issues credit for activities that take place below the baseline. Obligated parties who are above the baseline can purchase this credit to bring themselves back to the baseline.
baseload power plant	A plant that provides a steady flow of power regardless of total power demand by the grid. These plants run at all times through the year except in the case of repairs or scheduled maintenance.
bill benchmarking	Allows consumers to compare their energy use to a relevant local benchmark or efficient user. This helps answer the question: 'Am I a high- or a low-energy user?'
block tariffs	Prices that vary depending on the quantity of electricity consumed. For example, under a 'rising block tariff', the more electricity is used, the higher the cost of electricity. The purpose is usually to protect low prices for basic energy services.
borrowing	The ability of obligated parties to bring forward units from future compliance periods to meet current obligations in an energy efficiency obligation scheme. Borrowing can be short term (borrowing only from the subsequent year) or long term (borrowing from two or more years in advance).
bounded rationality	The concept that, because individuals have limited time, information and ability to apply to making a decision, they will apply rationality only after having greatly simplified the choices available. They therefore settle for a satisfactory solution rather than the optimal one.
business as usual	An estimate of future patterns of energy consumption and greenhouse gas emissions that assumes there will be no major changes in attitudes and priorities.

cap-and-trade scheme	In a cap-and-trade scheme, the Government imposes a cap on the commodity it wants to control (in this case energy use) and issue permits equivalent to units of the cap. People who wish to use the commodity must purchase and surrender a permit.
carbon	Generally refers to the six major greenhouse gases.
carbon cost	See *carbon price*.
carbon dioxide (CO_2)	A naturally occurring gas; it is also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's temperature.
carbon dioxide equivalent (CO_2-e)	A standard measure that takes account of the different global warming potential of different greenhouse gases and expresses the effect in a common unit.
carbon price	The cost imposed on emitting carbon into the atmosphere. It can be a tax imposed by government, the outcome of an emissions trading market or a hybrid of taxes and permit prices. The various ways of creating a carbon price can have different effects on the economy. Also referred to as 'carbon cost'.
climate change	As defined by the UNFCCC, a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability over comparable time periods.
cogeneration	Combined production of electricity and useful heat (for hot water or space heating) from the same process. Also known as combined heat and power.
complementarity	(Of a policy measure) suitable for application ('complementary') in an environment where a carbon price is expressed because the measure is targeted at a market failure that will not be affected by a carbon price or impinges on the carbon price's effectiveness; and the measure does not actively hinder the effectiveness of a carbon price.
compliance period	The period during which obligated parties are required to comply with relevant scheme requirements.
congestion pricing	Congestion pricing typically involves charging a time-varying fee for access to congested parts of the road network. Congestion is an 'externality' because road users do not take into account the effects of their use of the network on other users. The benefits of charging for access at peak times (faster trips, improved local air quality) can exceed the costs. Time-of-use charging for electricity is another form of congestion pricing.
Copenhagen Accord	The Copenhagen Accord was drafted by a representative group of world leaders and taken note of by the Conference of the Parties to the United Nations Framework Convention on Climate Change at the Copenhagen Conference in December 2009. The Accord makes a number of first-time statements of cooperative action by developed and developing countries to combat climate change. The Accord is a high-level political agreement and is not a legally binding document. Countries were invited to associate with the Accord and submit emissions reduction goals early in 2010. As at July 2010, 135 countries had formally expressed support for the Accord and of these, 82 countries had submitted targets and actions to reduce greenhouse gas emissions.
cost-effective	A measure is cost-effective when it achieves a desired outcome (for example, obtaining a desired amount of energy savings) at a lower cost than another measure. Cost-effectiveness is not the same as economic efficiency. An outcome is economically efficient when the value of the benefits in monetary terms exceeds the costs; in contrast, cost-effectiveness analysis does not analyse the value or social benefit of an outcome, it just compares the costs of different ways of achieving it.
cost-reflective pricing	Pricing is cost-reflective if prices accurately capture the costs of supplying a good. For some goods or services, such as electricity, the cost of supply varies according to the time at which the good is consumed.

coverage	The scope that a policy covers. In relation to a mandatory energy efficiency scheme, a covered sector or entity is one included within the scheme, either as part of calculating size of the obligation or meeting part of the obligation.
CPRS scenarios	Two policy scenarios using the CPRS to achieve emissions reductions in 2020 of 5 per cent below 2000 levels (CPRS –5) and 15 per cent below 2000 levels (CPRS –15), which were modelled and published in *Australia's low pollution future*.
credit	A unit of energy efficiency that can be surrendered to meet a mandatory energy efficiency obligation.
critical mass	The minimum amount (of something) required to start or maintain a venture.
deemed credit	Commonly occurs under existing mandatory energy efficiency obligations. A regulator defines a list of activities which, if completed in the manner and form dictated by the regulator, will be deemed to have achieved an amount of energy efficiency that can be credited towards a mandatory obligation.
demand management	Policies and programs designed to influence consumer demand for goods and/or services. In the energy sector it refers to policies and programs designed to reduce consumer demand for electricity and other energy sources. In the electricity market it generally refers to actively managing demand at times of peaks and constraints—for example, through controlling loads or price signals.
demand-side participation	Refers generally to active engagement of energy consumers in managing the supply–demand balance—usually through time-of-use price response, active management of loads or distributed generation.
demonstration	Projects, programs and activities that aim to test and showcase innovative approaches, technologies and models which, if successful, could have widespread implementation.
direct load control	Management of electricity load remotely — for example, hot-water systems or air conditioners that can be turned down during times of peak demand.
distributed energy	See *distributed generation*.
distributed generation	Production of electricity from power stations which are connected to the distribution network (as opposed to the transmission network). Generally these are small to medium scale with capacity less than 30 MW. In Australia, distributed generation most often relates to diesel, gas (including cogeneration) or renewables (including solar, wind, micro hydro or biomass). Also referred to as 'distributed energy', 'on-site generation' or 'embedded generation'.
distribution network	Low-capacity electricity wires or gas pipelines designed to transport energy to many customers. Most consumers are connected to the distribution network (as opposed to the transmission network). In the electricity market distribution networks are defined generally as network below 220 kVa.
electric vehicle	A vehicle that is propelled by a motor powered by electrical energy.
embedded generation	See *distributed generation*.
emissions	The release of greenhouse gases into the atmosphere.
emissions intensity	A level or amount of emissions per a specified unit of economic output, such as GDP, sales revenue or goods produced.
emissions trading	A market-based approach to reducing emissions that allows obligated parties to achieve reductions below what is required and to trade the excess reductions. In general, trading can occur at the domestic, international and intra-company levels. International emissions trading constitutes one of the Kyoto mechanisms, and is designed to provide developed countries with flexibility in reducing emissions to achieve their agreed commitments.

energy efficiency	The ratio of outputs to energy inputs.
energy efficiency improvement	Using less energy to achieve the same level of outcomes or performance, or improving the level of outcomes or performance from the same amount of energy.
energy efficiency governance	The use of political authority, institutions and resources by decision-makers and implementers to achieve improved energy.
energy efficiency obligation	An economy-wide mechanism that creates a market to encourage energy efficiency savings and meet a mandatory energy efficiency target. Under this mechanism, obligated parties acquit their liability by directly investing in projects that generate energy efficiency gains or by purchasing a credit representing an energy efficiency gain that has occurred from a project elsewhere.
energy intensity	The quantity of energy used per unit of economic output produced.
energy market participants	Generally refers to large generators, network service providers, retailers and large customers who engage directly with the market. 'Market participant' is a technical term within the energy market as all market participants must be registered with the Australian Energy Market Operator. It therefore excludes most distributed generation and most customers as they buy energy through a retailer.
energy performance contracting	When an energy service company is engaged to improve the energy efficiency of a facility, with the guaranteed energy savings paying for the capital investment required to implement improvements.
energy service companies (ESCOs)	Companies that offer energy efficiency improvement and related services such as advice, audits, business case assessment, design solutions, process optimisation, procurement and installation/commissioning of technologies and systems and, in some cases, asset management and innovative project financing.
energy synergies	Coordinated use of waste streams among sites to re-use by-products from transformation processes that might otherwise be wasted. An example of this is the recovery and re-use of heat resources from manufacturing sites.
externality	Externalities occur where a party either does not pay the full costs for their actions, or is not paid for the benefits that they generate for other parties. If the externality is a benefit, it is sometimes referred to as a 'spillover' as they create benefit 'spills over' to other parties.
final energy use	The total amount of energy consumed in the final or end use energy sectors. It is equal to primary energy use less energy consumed or lost in conversion, transmission and distribution.
first mover (or early adopter) disadvantage	Commonly occurs when an individual or business bears the majority of costs associated with introducing a new concept or technology, which may over time deliver benefits to a range of other individuals or businesses without associated flow-through costs.
fuel switching	The substitution of one type of fuel for another. Switching to lower carbon-content fuels, such as from coal to natural gas, can lead to reduced CO_2 emissions.
green economy	Refers to a possible economic development model where renewable and low-carbon sources of energy play a core role in 'decarbonising growth'— by supplying low-carbon energy to replace the consumption of fossil fuels, creating new business opportunities and developing green skills.
greenhouse effect	The trapping of heat by naturally occurring heat-retaining atmospheric gases (water vapour, carbon dioxide, nitrous oxide, methane and ozone) that keeps the earth warmer than if these gases did not exist.
greenhouse gases	The atmospheric gases responsible for causing global warming and climate change. The major greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

green skills	The technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community.
high energy performance standards (HEPS)	Technical requirements for appliances, buildings or equipment manufactured, built in or imported to Australia, which ensure that they reach very high energy efficiency performance.
IEA 17	Australia, Austria, Canada, Denmark, Finland, France, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom and United States.
industrial synergies	Traditionally separate industries cooperate to exchange materials, energy, water and/or by-products. By doing so, they aim to yield collective benefits greater than the sum of individual benefits. (MR Chertow, '"Uncovering" industrial symbiosis', *Journal of Industrial Ecology*, Winter 2007, vol. 11, no. 1, pp. 11–30.)
information asymmetry	A situation where one party to a transaction has more or better relevant information than another, which can lead to resources being allocated less efficiently than under conditions of perfect and symmetric information. In the energy efficiency context, one example is the energy efficiency of consumer durables: producers of these goods are better informed about their energy efficiency than consumers are, and two appliances that look very similar can have significantly different energy efficiency performance.
innovation	The process that translates knowledge into economic growth and social wellbeing, through technology development and application, and through business processes and models.
intensity targets	Policies that specify emissions reductions relative to productivity or economic output, for instance, tonnes of CO_2-e per million dollars GDP.
Intergovernmental Panel on Climate Change (IPCC)	Established in 1988, the IPCC surveys worldwide scientific and technical literature and publishes assessment reports that are widely recognised as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies.
large energy users	Corporations defined under the *Energy Efficiency Opportunities Act 2006*. Typically, these Australian corporations use more than 0.5 PJ of energy per year.
light vehicle	Four-wheeled road vehicles with a gross vehicle mass of 3.5 tonnes or less. There are typically three main categories of light vehicles: passenger vehicles, sports utility vehicles and light commercial vehicles.
low-emissions technology	Technology that produces a product with minimal greenhouse gas emissions. The term is commonly used to refer to power generation technologies (such as renewable, nuclear and clean coal generation), but applies equally to other sectors, including transport and agriculture.
macroeconomics	The branch of economics that deals with the performance, structure and behaviour of the economy as a whole.
market failure	A situation where the market is not able to provide an efficient level of production and consumption of goods and services.
minimum energy performance standards (MEPS)	Minimum technical requirements for appliances manufactured or imported to Australia to guarantee that they reach minimum energy efficiency performances. MEPS typically cover appliances such as refrigerators, air conditioners and lamps.
National Electricity Law	The key national legislation governing the electricity market.

National Electricity Rules	The key form of regulation in the electricity market, supporting the National Electricity Law. Managed by the Australian Energy Market Commission (AEMC) through a Rules change process defined in the law.
network losses	Energy losses incurred in transporting energy over a network. It can include: heat lost through resistance in electricity wires, gas leaks, metering errors and theft. It can also include energy used in operating the network—such as gas to run compressors in pipelines.
network service providers	The operator of a distribution or transmission network.
non-network alternative	Any option that can replace the need for a network expansion. Usually this is some form of distributed generation or active demand management.
obligated parties	Under a mandatory energy efficiency scheme, obligated parties are those organisations that must meet the obligation.
off-peak tariffs	Pricing that provides discounts for energy use at non-peak times in order to provide incentives for demand shifting.
payback	The time period over which the capital outlay for an energy efficiency improvement will be recouped from the resulting savings on energy bills.
peak demand	The maximum demand recorded in a given area. In the electricity market, to ensure reliability, supply capacity (generation and network) must be greater than the peak demand. Peak demand may only occur a few hours a year and is often driven by temperature due to heating and cooling loads.
pilot project	A project aimed at testing and demonstrating technical feasibility, reliability and durability of a new technology or solution.
plug-in hybrid electric vehicle	A vehicle that can source its power from grid electricity as well as a conventional internal combustion engine.
post facto credit	Occurs under some existing mandatory energy efficiency obligations. Compared to deemed credit, a post facto credit is generated under a more rigorous baseline-and-credit methodology. A historical baseline is established for a site or a project, and once new equipment is installed, credit is claimed post facto for energy reductions achieved against the historical baseline. This methodology favours technologies and projects where the value of credit is high compared to transaction costs.
price signal	See *carbon price*.
primary energy use	Also referred to as 'total domestic energy use'. The total of the energy consumption of each primary fuel (in energy units) in both the consumption conversion and end use sectors. It includes the use of primary fuels in conversion activities—notably the consumption of fuels used to produce petroleum products and electricity. It also includes own use and losses in the conversion sector.
private benefit	If an entity invests in an energy efficiency improvement, the private benefit associated with that improvement is the advantage that accrues to the relevant entity. Private benefits do not include the benefits that the improvement might yield to others in the economy (for example, through decreased greenhouse gas emissions).
private cost	If an entity invests in an energy efficiency improvement, the private cost is the amount that the relevant entity pays for that improvement. Private costs do not include the costs that the improvement might impose on others in the.
property assessed clean energy (PACE) financing	A financing approach where funding lent to finance property retrofits is subsequently repaid through increased land rates to local governments.

public good	In economics, a (pure) public good is a good which is non-excludable (once the good is produced, no one can be excluded from its benefits) and non-rival (one person's consumption of the good does not prevent another person consuming it). Examples are national defence and publicly available information. Because people can receive the benefits of public goods without paying themselves, private markets are likely to undersupply these types of goods.
purchasing power parity (PPP)	An economic theory used to create hypothetical exchange rates that adjust for differences in price levels across countries. Under a PPP exchange rate, one Australian dollar buys the same amount of goods and services in every country.
renewables	Energy sources that are constantly renewed by natural processes. These include non-carbon technologies such as solar energy, hydropower and wind, as well as technologies based on biomass. Life-cycle analyses are required to assess the extent to which such biomass-based technologies may limit net carbon emissions.
smart grid	Generally, the use of active real-time communications capacity to provide advanced functionality in the electricity grid—for example, through live monitoring or remote switching of substations or transformers. Usually also includes smart metering and in-home services such as load control.
smart meters	Generally, meters with some form of remote communication and a range of advanced functionalities, such as remote connection, links to in-home displays or the capacity to manage local load remotely (for instance hot water or air conditioning). Electricity smart meters generally also provide interval metering, recording use in half-hour intervals, and so can allow for time-of-use pricing (unlike traditional accumulation meters).
social benefit	The social benefit of an energy efficiency improvement is the sum of the private benefit to the entity making the improvement and any benefits that the improvement yields for others in the economy (for example, through decreased greenhouse gas emissions).
social cost	The social cost of an energy efficiency improvement is the sum of the private cost to the entity making the improvement and any costs that the improvement imposes on others in the economy.
social norm	An expectation within a society or group that people will behave in an established way. Once a social norm becomes established, it perpetuates because people prefer to conform to the norm given the expectation that others are also going to conform to it.
spillovers	Externalities resulting from the activity of one agent and that affect other agents. For instance, demonstration projects of new technologies can create beneficial spillovers for their market adoption, such as improved skills, reduced costs, or enhanced social acceptance.
split incentives	A situation when the parties engaged in a contract have different goals and different levels of information. An example is where neither owners nor tenants have sufficient incentive to spend capital upgrading the energy efficiency of a building as the benefit will be shared by the other party.
stationary energy	Energy produced and used by stationary equipment. Includes energy used for electricity generation; fuels consumed in the manufacturing, construction and commercial sectors; and fuels used for other sources like domestic heating.
step change	An important and discontinuous change in observed trends.
supply chain	The set of businesses that are involved in making a finished product. For example, the supply chain for bread would include wheat farmers, millers, bakers, packaging manufacturers, transport companies and so on.
Task Group	Prime Minister's Task Group on Energy Efficiency

time-of-use tariffs	Pricing which provides discounts for energy use at non-peak times or penalties for use at peak times in order to provide incentives for demand shifting.
transmission network	High-capacity electricity wires or gas pipelines designed to transport energy long distances. Only large generators and some very large users are connected directly to the transmission network. In the electricity market, transmission networks are defined generally as networks of 220 kVa or above.
trigeneration	Production of three forms of energy (electricity, useful heat and cooling) from the same process. Trigeneration is a cogeneration unit with an additional device to produce cooling.
useful output	The output that a process is intended to produce, that is, not the waste or by-products generated by the process.
United Nations Framework Convention on Climate Change (UNFCCC)	An international treaty concluded in 1994 aimed at achieving the stabilisation of greenhouse gas concentrations in the atmosphere.
valley of death	Period during which firms 'take on substantial risk as the technology requires proof in the intended operating environment and may not be cost competitive at first—even in cases that later turn out to be commercially successful'. (R Garnaut, *The Garnaut Climate Change Review: Final report*, 2008.)
waste heat recovery	Recovery of by-product heat generated by a transformation process for use in a second process.
white certificate	A tradeable instrument issued to certify that a certain reduction of energy consumption has been attained. White certificates are used to certify that a liable party has achieved its part of an obligation under a mandatory energy efficiency scheme.
zero-emissions building	Generally, a building that over the course of a year offsets as many greenhouse gas emissions as it creates (or generates enough renewable energy to power itself).

References

Ajzen, I & M Fishbein, 'The influence of attitudes on behaviour', in D Albarracín, B Johnson & M Zanna (eds), *The handbook of attitudes*, Erlbaum, 2005, pp. 173–221.

Asch, S, 'Opinions and social pressure', *Scientific American*, vol. 193, 1955, pp. 31–5.

Australian Alliance to Save Energy, *Summary of energy efficiency advocates meetings*, 15–16 February 2010.

Australian Building Codes Board, *Regulatory impact assessment for the Residential Building Code of Australia*, 2009.

Australian Bureau of Agricultural and Resource Economics, *Australian energy statistics*, 2010.

—— *Energy in Australia*, 2010.

—— *Australian energy projections to 2029–30*, 2010.

Australian Bureau of Statistics, *Detailed energy statistics, Australia, 2001–02*, ABS cat. no. 4648.0.55.001, March 2004.

—— *Household expenditure survey, Australia: Detailed expenditure items 2003–04*, ABS cat. no. 6535.0.55.001, February 2006.

—— *Environmental views and behaviour, 2007–08*, ABS cat. no. 4626.0.55.001, 2009.

—— *Australian historical population statistics*, ABS cat. no. 105.0.65.001.

—— *Motor vehicle census*, ABS cat. no. 9309.0.

—— *Yearbook Australia 2009–10*, ABS cat. no. 1301.0, 2010.

Australian Competition and Consumer Commission, *State of the energy market*, 2009.

Australian Council of Trade Unions & Australian Conservation Foundation, *Green gold rush: How ambitious environmental policy can make Australia a leader in the global race for green jobs*, October 2008.

Australian Energy Market Operator, *Electricity statement of opportunities*, 2009.

Australian Energy Regulator, *New South Wales distribution determination, 2009–10 to 2013–14*, 2009.

—— *State of the energy market*, 2009.

Australian Public Service Commission, Management Advisory Committee, *Empowering change: Fostering innovation in the Australian Public Service*, Commonwealth of Australia, 2010.

Australian Sustainable Built Environment Council Climate Change Task Group, *The second plank update,* prepared by the Allen Consulting Group, June 2010.

Australian Transport Council & Environment Protection and Heritage Council, *Potential measures to encourage the uptake of more fuel efficient, low carbon emission vehicles: Public discussion paper*, September 2008.

Australian Trucking Association, *Submission in response to Vehicle Fuel Efficiency Discussion Paper*, 2008.

Bandura, A, 'Personal and collective efficacy in human adaptation and change', in JG Adair, D Belanger & K Dion (eds), *Advances in psychological science, vol. 1: Personal, social and cultural aspects*, Psychology Press, UK, 1998, pp. 51–71.

Berrutto, V, P Bertoldi, E Vine, S Rezessy, J Adnot & A Iqbal, *Developing an ESCO industry in the European Union*, 2004.

Bertoldi, P & S Rezessy, 'Tradeable white certificate schemes: Fundamental concepts', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 237–55.

Bharvirkar, R, C Goldman, D Gilligan, T Singer, D Birr, P Donahue & S Serota, *Performance contracting and energy efficiency in the state government market*, Lawrence Berkeley National Laboratory, research paper 1202E, 2008.

Bikhchandani, S, D Hirshleifer & I Welch, 'Learning from the behavior of others: Conformity, fads, and informational cascades', *Journal of Economic Perspectives*, vol. 12, 1998, pp. 151–70.

Bureau of Infrastructure, Transport and Regional Economics, *Estimating urban traffic and congestion costs for Australian cities*, BITRE Working Paper no. 71, 2007.

—— *Greenhouse gas emissions from Australian transport: Projections to 2020*, BITRE Working Paper no. 73, 2009.

Bloomberg Businessweek, *Speed demons: How smart companies are creating new products and whole new businesses almost overnight*, 27 March 2006.

Carr, K, *Powering ideas: An innovation agenda for the 21st century*, Commonwealth of Australia, 2009.

Chertow, MR, '"Uncovering" industrial symbiosis', *Journal of Industrial Ecology*, Winter 2007, vol. 11, no. 1, pp. 11–30.

Child, R, O Langniss, J Klink & D Gaudioso, 'Interactions of white certificates with other policy instruments in Europe', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 283–95.

The Climate Group, 'UN climate talks: World's states and regions sign Bonn Statement on road to COP16', press release, 2 June 2010.

ClimateWorks Australia, *A low carbon growth plan for Australia*, 2010.

Commonwealth of Australia, *Energy Efficiency in Government Operations (EEGO) Policy*, 2006.

—— *Review of Australia's automotive industry final report*, 22 July 2008.

—— *Australia's low pollution future: The economics of climate change mitigation*, 2008.

—— *Tracking to Kyoto and 2020: Australia's greenhouse emissions trends 1990 to 2008–2012 and 2020*, 2009.

—— *The Australian Environment Act: Report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999*, October 2009.

—— *Australia's future tax system: Report to the Treasurer*, December 2009.

—— *First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program*, 2010.

Council of Australian Governments, *National competition policy review*, Attachment B, decision 2.2(c), 10 February 2006.

—— *National Strategy on Energy Efficiency*, July 2009, at www.coag.gov.au.

—— communiqué, 7 December 2009, www.coag.gov.au, accessed 29 June 2010.

CSIRO, *Intelligent grid: A value proposition for distributed energy in Australia*, 2009.

Department of Climate Change, *National Greenhouse Gas Inventory by economic sector*, 2007.

—— *Carbon Pollution Reduction Scheme Green Paper*, July 2008.

—— *Australia's fifth national communication on climate change*, report under the United Nations Framework Convention on Climate Change, 2010.

Department of Climate Change and Energy Efficiency, Australian Greenhouse Emissions Information System, *Australia's National Greenhouse Gas Inventory*, www.ageis.greenhouse.gov.au/NGGI.aspx.

—— *National Greenhouse and Energy Reporting*, www.climatechange.gov.au/reporting.

Department of the Environment, Heritage, Water and the Arts, *Switch on gas: Australia's strategy to improve the energy efficiency of gas appliances and equipment, 2005–2015*, December 2004.

—— *Energy use in the Australian residential sector 1986–2020*, 2008.

—— *Computers and energy efficiency in Australia: A report on testing of 56 randomly selected computers*, 2009.

—— *Energy use in the Australian Government's operations 2007–08*, 2009.

—— *Equipment energy efficiency program: Achievements 2008–09,* report 2009/14, 2009.

Department of Finance and Administration, *Governance arrangements for Australian Government bodies*, August 2005.

Department of Finance and Deregulation, *Review of the Australian Government's use of information and communications technology*, 2008.

—— *Engage: Getting on with Government 2.0 — report of the Government 2.0 Taskforce*, December 2009.

Department of Resources, Energy and Tourism, *Smart meter cost benefit analysis: Consumer report: NERA*, 2008, www.ret.gov.au/Documents/mce/emr/smart_meters/default.html.

—— *First opportunities: A look at results from 2006–2008 for the Energy Efficiency Opportunities program*, 2010.

Digital CEnergy, *Discussion paper: Television energy rating labels: The case, and proposal, for MEPS and labelling televisions,* www.energyrating.gov.au/library/pubs/200710-tv-meps-labelling.pdf.

DomGas Alliance, *Promoting domestic gas supply through common-use infrastructure*, 2008.

Eggers, WD & SK Singh, *The public innovator's playbook: Nurturing bold ideas in government*, Deloitte Research, 2009.

Ellerman, AD, PL Joskow, R Schmalensee, JP Montero & EM Bailey, *Markets for clean air. The US acid rain program*, Cambridge University Press.

Elliott, C & E Stratford, *Energy efficiency measures in low income housing — Sub-project one: Literature review*, University of Tasmania, March 2009.

Energy Consult, *Energy bill benchmarking: Decision Regulatory Impact Statement*, March 2010.

European Commission, *Low energy buildings in Europe: Current state of play, definitions and best practice*, Brussels, 25 September 2009, www.ec.europa.eu/energy/efficiency/doc/buildings/info_note.pdf, accessed 23 June 2010.

Eyre, N, 'Regulation of energy suppliers to save energy: Lessons from the UK debate'*, Proceedings of the British Institute of Energy Economics Conference*, 2008.

Ferguson, M, 'Energy prices will keep rising', *The Australian*, 22 March 2010.

Fogg, BJ, *A behavior model for persuasive design*, Persuasive Technology Lab, Stanford University.

Garnaut Climate Change Review, *Interim report to the Commonwealth, state and territory governments of Australia*, February 2008.

Garnaut, R, *The Garnaut Climate Change Review: Final report*, Cambridge University Press, Melbourne, 2008.

George Wilkenfeld & Associates, *Consultation regulation impact statement: National legislation for appliance and equipment minimum energy performance standards (MEPS) and energy labelling,* prepared for the Department of the Environment, Water, Heritage and the Arts, 2010.

—— *Prevention is cheaper than cure: Avoiding carbon emissions through energy efficiency: Projected impacts of the Equipment Energy Efficiency program to 2020,* January 2009, www.energyrating.gov.au.

Global Fuel Economy Initiative, *50 by 50 global fuel economy initiative: Making cars 50% more fuel efficient by 2050 worldwide*, 2009.

Gurney, A, M Ford, K Low, C Tulloh, G Jakeman & D Gunasekera, *Technology: Toward a low emissions future,* 2007, ABARE research report 07.16, prepared for the Department of Industry, Tourism and Resources, Canberra.

Hatfield-Dodds, S & R Denniss, *Energy affordability, living standards and emissions trading: Assessing the social impacts of achieving deep cuts in Australian greenhouse emissions*, report to The Climate Institute, CSIRO Sustainable Ecosystems, Canberra, 2008.

Hopper, N, C Goldman, D Gilligan, TE Singer, D Birr, *A survey of the US ESCO industry: Market growth and development from 2000 to 2006*, Lawrence Berkeley National Laboratory, 2007.

Horne, RE, C Hayles, D Hes, C Jensen, L Opray, R Wakefield & K Wasiluk, *International comparison of building energy performance standards*, Centre for Design, RMIT University, September 2005.

Independent Pricing and Regulatory Tribunal of New South Wales, *Review of regulated retail tariffs and charges for electricity 2010–2013*, 2010.

International Energy Agency, *World energy outlook*, 2006.
—— *Energy use in the new millennium: Trends in IEA countries*, 2007.
—— *Coal-fired power generation*, 2009.
—— *Energy efficiency governance: Reference Group terms of reference*, 2009.
—— *Energy technology transitions for industry, strategies for the next industrial revolution*, 2009.
—— *IEA scoreboard 2009,* 2009.
—— *Implementing energy efficiency policies 2009: Are IEA member countries on track?*, 2009.
—— *Technology roadmap: Electric and plug-in hybrid electric vehicles*, 2009.
—— *Transport, energy and CO_2: Moving toward sustainability,* 2009.
—— *World energy outlook: Executive summary*, 2009.

Jollands, N & M Ellis, *Energy efficiency governance: An emerging priority,* European Council for an Energy Efficient Economy 2009 Summer Study.

Kurani, K & T Turrentine, *Automobile buyer decisions about fuel economy and fuel efficiency: Final report to United States Department of Energy and Energy Foundation*, 2004.

Lazar, J & M McKenzie, *Electric vehicle standards in Australia: A scoping study,* 2009.

Lees, E, *European experience of white certificates*, World Energy Council project on white certificates, 2007, www.worldenergy.org/documents/white_certificate.pdf, accessed 7 June 2010.

Maher, S, 'Council in the dark on Rudd's reforms as relevant data does not exist', *The Australian*, 4 June 2010.

Marrian, C, *Industrial symbiosis: Literature and taxonomy*, 2007.

McKane, A, Lawrence Berkeley National Laboratory, 'Improving industrial energy efficiency: Energy management and effective policies', presentation at the National Environment Agency, Singapore, 30 April 2010, www.e2singapore.gov.sg/docs/Energy%20Management%20&%20Effective%20Policies.pdf.

McKinsey & Company, *Unlocking energy efficiency in the US economy*, 2009.

Metz, B, OR Davidson, PR Bosch, R Dave & LA Meyer (eds), *Climate change 2007: Mitigation of climate change*, contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, technical summary, 2007.

Meyers, S & S Kromer, 'Measurement and verification strategies for energy savings certificates: Meeting the challenge of an uncertain world', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 313–21.

Meyers, S, J McMahon & M McNeil, *Realized and prospective impacts of US energy efficiency standards for residential appliances: 2004 update*, Lawrence Berkeley National Laboratory, 2005.

Mundaca, L, L Neij, N Labanca, B Duplessis & L Pagliano, 'Market behaviour and the to-trade-or-not-to-trade dilemma in "tradeable white certificate"schemes', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 323–47.

National Housing Supply Council, *2010 State of Supply Report*, Chapter 2, 'Demand for housing', www.nhsc.org.au, accessed 8 July 2010.

National Transport Commission, *Freight transport in a carbon constrained economy*, July 2008.
—— *Carbon emissions from new Australian vehicles*, November 2009.

New South Wales Government, 'Energy savings scheme rule of 2009', New South Wales Government Gazette no. 99, www.ess.nsw.gov.au/documents/ESSRule.pdf.

New Zealand Ministry of Economic Development, *Domain Plan for the Energy Sector 2006–2016*, October 2006, www.med.govt.nz/upload/38617/domain-plan-for-energy-sector-20061017.pdf.

Nordqvist, J, *Evaluation of Japan's Top Runner Program*, www.aid-ee.org/documents/018TopRunner-Japan.PDF.

NSW Department of Environment, Climate Change and Water, 'Who cares about the Environment in 2009?', www.environment.nsw.gov.au/community/Whocares2009.htm.

Nuclear Energy Agency & International Energy Agency, *Projected costs of generating electricity*, 2009.

Obama, B, remarks at the launch of the *Building energy efficiency initiative*, www.energy.gov/news/7550.htm, accessed 7 June 2010.

Organisation for Economic Co-operation and Development), *Oslo Manual guidelines for collecting and interpreting innovation data*, 3rd edn, 2005.

—— *The OECD innovation strategy*, 2010.

Parsons Brinckerhoff Australia, *Energy network infrastructure and the climate change challenge*, report commissioned by Energy Networks Australia, 2009.

Paton, B, 'Efficiency gains within firms under voluntary environmental initiatives', *Journal of Cleaner Production*, vol. 9, 2001, pp. 167–78.

Pavan, M, 'Tradeable energy efficiency certificates: The Italian experience', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 257–66.

Pears, A, 'Making a greenhouse difference with Australia's buildings', *Proceedings of the Building Australia's future 2009 conference*, September 2009.

Pratt, C, 'Estimation and valuation of environmental and social externalities for the transport sector', paper presented at the Australasian Transport Research Forum, 2002.

PricewaterhouseCoopers, *Review of energy efficiency policy options for the residential and commercial building sectors*, report commissioned by the Energy Retailers Association of Australia, November 2008.

Productivity Commission, *The private cost effectiveness of energy efficiency*, Commonwealth of Australia, 2005.

Prymak, B, 'Industrial energy efficiency', presentation by US Department of Energy, February 2010, www.iacforum.org/iac/pdf/2010_Bill%20Prymak.pdf, accessed 8 July 2010.

Queensland Competition Authority, *Final decision: Benchmark retail cost index for electricity: 2010–11*, 2010.

Rogers, E, *Diffusion of innovations*, 5th edn, 2003.

Roshni, S, *Industrial ecology: Oxymoron, or the way of the future?*, 2009.

Rudd, K, at the 4th Australia – New Zealand Climate Change and Business Conference, 2008, www.asbec.asn.au/files/ASBEC.A5@work.web2_.pdf, accessed 15 July 2010.

—— 'Building a big Australia: Future planning needs of our major cities', address to the Business Council of Australia, 27 October 2009.

Sandu, S & R Petchey, *End use energy intensity in the Australian economy*, ABARE research report 09.17, 2009.

Smith School of Enterprise and Environment, *Future of mobility roadmap ways to reduce emissions while keeping mobile*, University of Oxford, 2010.

Stern, N, *The economics of climate change: The Stern Review*, Cambridge University Press, Cambridge, 2007.

Syed, A, J Melanie, S Thorpe & K Penney, *Australian energy projections to 2029–30*, ABARE research report 20.02, March 2010.

UK Treasury, *Energy efficiency innovation review: Summary report*, December 2005.

United Nations Development Programme, *Energy services for the Millennium Development Goals*, 2005.

United Nations Framework Convention on Climate Change, *Copenhagen Accord* (FCCC/CP/2009/L.7), 18 December 2009 (draft decision).

US Department of Industry, *Mining industry energy bandwidth study, pulp and paper industry energy bandwidth study, energy bandwidth for petroleum refining processes*, 2006.

US Environmental Protection Agency, *Report to Congress on server and data centre energy efficiency*, 2007.

Waide, P & B Buchner, 'Utility energy efficiency schemes: Savings obligations and trading', *Energy Efficiency*, vol. 1, no. 4, 2008, pp. 297–311.

Western Australian Government, *TravelSmart 2010: A 10 year plan*, 1999.

Western Australian Office of Energy, *Energy tariff increases*, www.energy.wa.gov.au/2/3263/64/electricity_tar.pm, accessed 29 June 2010.

—— *The impact of residential air-conditioning on the Western Australian electricity system*, 2004.

Wilkins, R, *Strategic review of Australian Government climate change programs*, Department of Finance and Deregulation, 2008, www.finance.gov.au/Publications/strategic-reviews/index.html.

Winton Sustainable Research Strategies, *A summary of the OSGS product development research (quantitative and qualitative)*, report for the Department of the Environment, Water, Heritage and the Arts, 2008.

World Economic Forum, *Energy vision update 2010: Towards a more energy efficient world*, 2010.