INFORMATION BARRIERS TO KNOWN TECHNOLOGIES

17

Key points

There are potentially large and early gains from better utilisation of known technologies, goods and services, including energy efficiency and low-emissions transport options.

Externalities in the provision of information and principal–agent issues inhibit the use of distributed generation and energy-saving opportunities in appliances, buildings and vehicles.

A combination of information, regulation and restructuring of contractual relationships can reduce the costs flowing from many of the market failures blocking optimal utilisation of proven technologies and practices.

The introduction of an emissions trading scheme will increase returns for business and households from adopting opportunities to lower their direct and indirect emissions. The opportunities will often involve adopting existing technologies and practices. However, market failures will impede adoption of opportunities that may be profitable once applied. Policies that tackle these market failures would lower the cost of mitigation across the economy.

As climate change impacts begin to be felt, there will also be cost-effective opportunities to adapt to these impacts by changing economic behaviour, with some changes requiring investment. As with migitation, reducing information and agency barriers will lower the costs of adaptation across the economy.

17.1 The impact of information and agency barriers

Two kinds of market failures are especially important in inhibiting the adoption of established technologies and practices. One relates to externalities in the supply of information and skills. The other involves a principal–agent problem—where the party who makes a decision is not driven by the same considerations as another party who is affected by it.

These market failures are most important for small to medium enterprises and households, where the benefits of reducing emissions are small relative to the transaction costs of securing them. Large firms are more likely to overcome information and principal–agent barriers, but may still miss opportunities where the benefits are relatively small or diffuse.

For mitigation, the barriers largely affect the adoption of energy efficiency (see Box 17.1), fuel switching and small-scale generation in buildings, industry and transport.

For adaptation, they will affect the adoption of water efficiency measures, and improvements to buildings to withstand the impacts of climate change (see Box 17.2). Private adoption of some water efficiency measures can occur over relatively short time frames. This is not the case for improvements to buildings, which typically have a life of 40 to 60 years or more, meaning that those built and modified today will need to be able to withstand the impacts of future climate change. The success of this will be inhibited somewhat by the availability of reliable information regarding climate change impacts and appropriate responses. This chapter focuses on changes required in the short to medium term and therefore discusses buildings alone in considering barriers to adaptation.

Box 17.1 What is energy efficiency?

Energy efficiency generally refers to reducing the amount of energy required to deliver an amount of a service, such as kilowatts per unit of heat. The International Energy Agency (2006) has estimated that increased energy efficiency could account for 45 to 53 per cent of global emissions reductions in projections to 2050.

Energy efficiency does not always correspond to economic efficiency, which involves maximising the efficiency of use of all resources (Sutherland 1994). Where efforts to improve energy efficiency require more input of capital, labour and other resources than is saved in energy, economic efficiency would be reduced.

Nevertheless, the evidence indicates that there are significant opportunities for increased energy efficiency in Australia that are economically beneficial (Allen Consulting Group 2004), despite methodological issues in accurately determining the quantum of the opportunity (Productivity Commission 2005).

Box 17.2 Impacts of climate change on buildings

The Commonwealth Government established a project in 2005 to investigate the capacity of Australia's building stock and building practices to maintain current levels of amenity in the face of a changing climate and the scope to consider changes in building practices to adapt to climate change.

The main impacts of climate change with implications for Australian buildings were found to be:

- increased energy consumption due to higher temperatures
- increased risk of damage from more intense tropical cyclones, storms and winds
- damage to foundations and pipe work from increased ground movement due to reductions in soil moisture
- increased flood damage from intensified weather events
- increased bushfire risk due to higher temperatures (BRANZ 2007; Holper et al. 2006).

It was also established that the Building Code of Australia, which already addresses the issue of minimum structural performance standards in buildings, will have a significant role to play to ensure that public health, safety and amenity are not put at risk by the impacts of climate change.

17.1.1 Mitigation potential

Various studies attempt to estimate the extent of mitigation opportunities in different sectors. Work by the IPCC (2007: 9, 409) suggests that the majority of global mitigation potential to 2030 at under US$20 per tonne of CO_2-e would occur in areas affected by information and principal–agent market failures, with around 5 billion tonnes of mitigation potential in the building sector alone out of a total abatement potential of 9–18 billion tonnes in all sectors.

Similarly, work by McKinsey & Company (2008) estimates that in 2020 Australia's emissions could be reduced by around 11 per cent below business as usual levels through zero and negative net cost mitigation opportunities.

Some studies of energy efficiency are overly optimistic as they do not include potentially unavoidable transaction costs from the uptake of more efficient products, such as time spent in information gathering and decision making, policy costs and appropriate discount rates (Stavins et al. 2007). Conversely, many studies are also conservative in limiting the potential for future technology development.

17.1.2 Rationale for additional policies

Some of the reasons given for government intervention to improve energy efficiency lack a sound economic basis. An effective emissions trading scheme would address the issues of reducing greenhouse gas emissions and urgency of action. The rationale for policies to support the uptake of low-emissions

technologies and practices should be the correction of market failures that increase the cost of mitigation or market failures related to other issues. If these market failures cannot be tackled cost-effectively then there is no case for action.

Reasons for energy efficiency policy that do not have a sound economic basis include:

- Energy efficiency policy is needed to ensure sectors meet their targets. Once an emissions trading scheme is in place the cap will prevent emissions from increasing in covered sectors.
- We need to invest in energy efficiency to lessen the impact of the carbon constraint. Investing in energy efficiency when there are no requisite market failures requiring correction is likely to lead to greater economic cost, not less.

These reasons should be rejected.

17.2 Information barriers

Individuals will rarely have perfect information relevant to a decision they are making. However, efficient adoption of established technologies and practices requires individuals to know:

- the options available
- the approximate costs and benefits of the different options
- how to deploy the options (including hiring experts)
- the cost of investigating the options.

Governments should not be expected to fill the gap in every situation where individuals lack sufficient information to make good decisions. However, where information barriers are caused by market failures, governments may sometimes be able to improve the efficiency of the market.

These market failures have their origins in the public good nature of some information, information asymmetry and bounded rationality. They are discussed below, together with policies to address them.

17.2.1 Public good information and spillovers

Some information is a pure public good as it is not possible to exclude individuals from using it, and one person's use of that information does not prevent others from using it.

Where information has public good characteristics, it is likely to be underprovided by the private sector (Jaffee & Stavins 1994a). 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.

Training and education have positive benefits to society and support the use of available information. Even if individuals have access to information regarding established technologies and practices, they, or commercial agents supplying

services to them, may require new skills or a wider body of knowledge to use that information (Consumer Affairs Victoria 2006). Given the wide range of technical issues associated with energy efficiency, gaps in the skill sets of specialists such as engineers or tradespeople could prevent the uptake of these options across a range of sectors.

17.2.2 Information asymmetry

Information asymmetry occurs when two parties to a transaction do not have equal access to relevant information.

There are potentially significant information asymmetries for appliances, vehicles and houses as it is extremely difficult for non-experts to determine the ongoing energy used by, for example, an appliance without outside assistance. This allows opportunism, as a product manufacturer could mislead a buyer on the efficiency and efficacy of a product, which the buyer is unable to verify.

As noted by the Productivity Commission (2005), market participants may attempt to gather or verify information to reduce information asymmetries through such expedients as obtaining an assessment of a product before they buy it. This can be costly and may only be done for large purchases such as houses or cars.

Some features of a good can increase the likelihood of information asymmetries. Where the quality of the good can be determined before purchase, there will be limited information asymmetry. Where the quality of the good can be determined only after purchase, repeat purchasing will overcome information asymmetries where the good is purchased regularly. Where the quality of a good cannot be determined even after purchase, it is difficult to overcome information asymmetries (Sorrel et al. 2004).

Adverse selection

Information asymmetry can lead to adverse selection, which can occur where sellers are better informed than buyers, resulting in lower-quality goods dominating a market (Akerlof 1970).

In a market where it is difficult for buyers to verify whether a product is of good or bad quality, they may be unwilling to pay a premium for goods that are actually of good quality. Even if manufacturers voluntarily give information on a product's quality, buyers may be wary of this information (Aronson & Stern 1984). Where this occurs, there would be limited incentives for manufacturers or developers to produce higher quality products (Jaffee & Stavins 1994b).

In the markets for appliances and houses, tenants and users of appliances have a strong incentive to reduce ongoing energy costs. Developers and manufacturers do not have this incentive unless they can command higher prices for more efficient buildings and appliances (Golove & Eto 1996) and in fact have a strong incentive to lower the upfront costs, usually by avoiding energy-saving features. Unless buyers can confidently assess the energy efficiency of buildings and appliances, most goods for sale on the market will be less energy efficient than if buyers could be sure of their quality.

17.2.3 Bounded rationality

Even where people have access to sufficient information, they may make decisions that are suboptimal. Situations of suboptimal decision making or 'bounded rationality' have been observed and documented in the behavioural economics literature (Camerer et al. 2004).

First, people faced with complex decisions, often use rules of thumb to aid decision making. Some rules of thumb deliver broadly accurate results. However, when Kempton and Montgomery (1982) examined how people estimated savings from investments in insulation, they found households significantly underestimated its cost-effectiveness.

Second, people often assign a budget in their own mind for a particular class of expenditure, hoping to constrain their expenditure (Thaler 1999). The implication is that if people have assigned a low budget to capital improvements in their home and a high budget to variable utility costs, they may be unwilling to reallocate their budget to undertake a capital upgrade that would lower their overall expenses.

Third, there are some predictable biases in human decisions that could result in decisions that are both personally and socially suboptimal (Kahneman & Tversky 2000). Particularly important biases include:

- biases towards the status quo
- high rates of discounting of future costs and benefits (IEA 2005).

Finally, information can be difficult to use, which may prevent people from weighing up the costs and savings of various options. Even where savings are known, households may pay them limited attention compared to their perceptions of upfront costs, effort, comfort and social norms (Komor & Wiggins 1988). In particular, people may have difficulties in making use of information that is probabilistic in nature (Camerer & Loewestein 2004). This factor will have particular implications for those faced with investment decisions necessary to avoid risks from the projected impacts of climate change.

17.2.4 Tailored information, education and training

Information, education and training programs can tackle the undersupply of public goods directly. Information and education programs have strong synergies with an emissions trading scheme, as they can help individuals to identify the energy and other costs affected by a carbon price and respond to it. This is particularly important during the scheme's initial phase, when the costs of many goods and services will change.

Public information programs

Basic media campaigns and pamphlets are often neither targeted nor tailored and there is considerable evidence that their effectiveness is limited (Cone & Hayes 1980). Information programs for households are more effective if they consider social and attitudinal issues and involve alternative communication techniques

such as audits, community-based programs and diffusion through social networks (Shipworth 2000). Developing these types of programs generally requires:

- identifying target groups and assessing their knowledge, attitudes and behaviours
- developing communications, possibly using social networks
- testing, evaluating and improving the program before rolling it out.

When governments lead by example, such as undertaking energy efficiency audits, this can support the credibility of such programs (Bjornstad & Brown 2004).

Programs need to be targeted and tailored to ensure that the right individuals receive suitable information. This seems to be done particularly well in the Western Australian Government's TravelSmart program (Box 17.3). Programs relevant for the general public include those that raise awareness of the benefits of energy efficiency, provide basic information on low-emissions practices and educate consumers on how to identify the costs and benefits of different low-emissions options.

A well-designed information program should:

- attempt to overcome biases by providing a simple comparison between current and future costs and current and future benefits
- use familiar language (such as payback periods)
- be located as close to the point of sale as possible.

In designing information programs for households, governments should tailor the program to their target audience, draw on the extensive literature on bounded rationality, and not rely on basic media campaigns.

Box 17.3 Tailored information: TravelSmart

Some individuals do not have ready access to basic information about the transport options that are available to them and the costs and benefits of those options. Interviews in Perth suggested that information failures may have prevented 24 per cent of all trips being switched from car to other modes of transport. The TravelSmart Household Program in Perth aims to overcome these information failures through tailored information provision, including:

- localising and simplifying information to make it relevant to people's needs
- providing motivation through dialogue and personalised communication
- assisting new users of public transport to navigate the system.

Education and training for specialists and industry

Where extensive knowledge and skills are needed, education and training programs will be more effective than public information programs. In industry, formal education and reskilling courses are generally suitable for addressing the lack of skilled professionals, such as engineers. There are also gaps in organisation-wide skills that support energy management, such as energy reporting (Paton 2001). Here companies may need to be engaged directly, as general information provision may be limited in its effectiveness (Energy Consult 2002).

Like public information programs, education and training programs need to be targeted and tailored. Target groups for programs should include:

- market intermediaries such as retailers and estate agents—for basic education programs
- managers and other non-specialists in business—for programs that raise awareness of practices for energy and carbon management
- specialists—for programs that cover practical skills in the installation and maintenance of low-emissions options for trades such as building and plumbing, and a mixture of theory, knowledge and skills for professions such as engineering (Desha et al. 2007).

Pprograms should be tailored around the information needs and structures of sectors and should use existing approaches where suitable, such as extension programs in the agricultural sector. New structures, such as the independent Carbon Trust that was established in the United Kingdom to specialise in delivering knowledge and skills to firms, may also be required.

As a general rule, participation in programs should be voluntary, allowing firms and individuals to make decisions based on the benefits of the program to them. Where certain costs and uncertain benefits confuse this decision, certification programs could provide an incentive for specialists to learn new information or mandatory requirements may be necessary. These requirements should only exist early in the transition to the carbon-constrained economy, as, in future, these new energy management processes will become integrated into standard business practices.

The Commonwealth Government's Energy Efficiency Opportunities program provides an example of combined mandatory and voluntary activities. The program requires businesses using more than 0.5 petajoules of energy per annum to undertake an audit to identify areas for efficiency gains. To assist them, the government provides instructions and free training. Implementation of the audit recommendations is voluntary. The final review of the precursor to this program, the Energy Efficiency Best Practice program, found that it had been cost effective, and that projects planned under the program could save $74 million by 2010. The regulatory impact statement conducted before the introduction of the Energy Efficiency Opportunities program estimated a net present value of $760 million (Parliament of Australia 2005).

The Review has formed a favourable view of the Energy Efficiency Opportunities program. Governments should remove overlapping and mandatory programs.

It would be productive for the Ministerial Council on Education, Employment, Training and Youth Affairs to investigate the support required to enable universities and other education institutions to deliver training, education and certification in low-emissions and climate change resilience options to specialists, particularly engineers, tradespeople and business managers.

In the building sector this could specifically entail:

- developing retraining courses and incorporating energy efficiency components into vocational and university courses
- providing tools such as design guides and advisory services
- fostering on-site training through demonstration programs
- introducing accreditation to provide an incentive for specialists to learn.

17.2.5 Third-party programs

Information programs may be less effective when they attempt to convey complex information or where habits or practices are entrenched. Specialists, such as energy service companies, can use economies of scale in gathering and processing information. These companies are paid by firms to make decisions about which technology to buy, thus spreading the cost of gathering information across several parties.

Unfortunately, transaction costs make current forms of energy service contracting less suitable for smaller parties with significant information and bounded rationality problems, such as households and small businesses (Sorrell 2005).

Various countries have attempted to foster the market for energy service contracting and auditing although with limited success to date (Eoin Lees Energy 2006). For example, energy retailers could offer contracts to households for 'services' such as heating, hot water and appliances, creating an incentive for the retailers to improve households' energy efficiency.

Governments have tried two approaches to overcoming this problem. One subsidises third parties to provide advice or directly install low-emissions options in houses and businesses. The other creates obligations or incentives for parties, such as energy retailers, to deliver energy efficiency improvements in households and firms. There are a number of problems with the approaches.

First, if the number of audits and subsidised installations is limited and schemes rely heavily on households to make the decision to take up these options, the schemes will tend to favour informed individuals who are already motivated to save energy and so create adverse distributional impacts. Therefore, if these approaches are used they should focus on low-income households.

Second, there are challenges in the obligations or incentives approach in estimating the energy savings from these programs.

Finally, there are problems in requiring that retailers undertake activities to improve energy efficiency when their primary incentive is to sell more energy.

There is evidence that these programs can be effective in changing household energy use (Nadel & Geller 1996; Eoin Lees Energy 2006). If they can be developed to be cost effective they could lead to changes in both household behaviour and building efficiency that benefit households and the economy more widely.

Overall, there seems to be a case for removing requirements for retailers to improve energy efficiency in households and instead subsidising a limited amount of energy efficiency audits targeted at low-income households.

17.2.6 Expanding mandatory disclosure

Ensuring that both parties in a transaction have access to sufficient information will generally be the most effective way to address information asymmetry. Disclosure schemes, such as energy efficiency ratings, complement an emissions trading scheme as they assist individuals to act on the price signal.

Disclosure schemes will be far more effective if they are mandatory, as sellers are only likely to apply voluntary labels to high-performing products, leaving consumers unable to select among average and poorly performing products (Productivity Commission 2005).

The disclosure mechanism should be designed to should show the ongoing running costs of the good, use familiar language (such as payback periods), and should be located at the point of sale, as for public information programs.

Mandatory disclosure should be applied to goods where it is cost effective to do so. This will be determined largely by the administrative cost of the scheme, its accuracy and the potential savings to consumers. The potential for accurately and cheaply rating energy use will vary between goods. For refrigerators, it is relatively cheap to assess their energy use—most households' patterns of using a refrigerator will have limited effect on the comparative efficiency of different models. For vehicles, the situation is more complex, as a driver's behaviour may influence the efficiency of some cars relative to others, but even partially accurate ratings are likely to be valuable.

Australia already has a labelling program in place for appliances. It is argued that labelling programs for appliances are successful in assisting the uptake of more energy-efficient products in Australia and other countries (George Wilkenfeld and Associates & Energy Efficient Strategies 1999: 49).

Governments should continue to implement the energy label program for appliances where energy consumption is substantial and there is significant variation in performance. These include refrigerators, freezers, washing machines, water heaters, televisions and air conditioners.

Australia also has a labelling program for new vehicles. Arguably, labelling for second-hand vehicles, which are likely to be older and in some cases less efficient, is even more important. This, however, would be more costly than for new vehicles. New vehicles could have one test per production run, whereas second-hand vehicles would need individual tests. The lower value of the car would raise the cost of the test as a proportion of the total cost of the vehicle. Overall, labelling of used cars is unlikely to be cost effective.

The Australian Capital Territory (ACT) has introduced a mandatory energy efficiency rating scheme for houses at the point of sale. A recent study suggests that there is a statistically significant correlation between house prices and energy efficiency ratings (Department of the Environment, Water, Heritage and the Arts 2007). Modelling results suggest that, for a house worth $365 000, increasing the rating by half a star would, on average, increase its market value by $4489.

Concerns have been raised about the cost of this scheme, particularly the cost of rating assessments. Administrative simplicity and cost are obviously key features in scheme design and building owners should have the option of electing to undertake a more detailed assessment if they feel this would give a more accurate rating and that this would have value for them.

Although the ACT scheme does not apply ratings at the point of lease, doing so would assist in overcoming some of the principal–agent problems discussed below.

The success of the ACT scheme suggests that a national building rating program could be useful throughout Australia at the point of sale and the point of lease.

Concerns with the accuracy of building rating schemes (Williamson 2004) rightly raise the issue that efforts need to be made to ensure that rating tools are as accurate, flexible and useful as possible.

17.3 Principal–agent problems

17.3.1 Principal–agent market failures

Principal–agent problems can occur when 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 incentive as renters (principals) to lower the ongoing energy cost of the appliances (IEA 2007a).

The kind of principal–agent relationship can influence both the nature of the problem and the appropriate policy response. The International Energy Agency has categorised four kinds of principal–agent relationships (see Table 17.1), using energy use as an example, depending on:

- who chooses the energy-using equipment
- who pays the energy bills.

In all four kinds the principal uses the equipment.

Table 17.1 Four kinds of principal–agent problems

	Principal chooses technology	Agent chooses technology
Principal pays the energy bill	**1:** The principals select the energy-using equipment and pay the energy bill. They have an incentive to select efficient equipment and lower their energy use. There is no principal–agent problem.	**2:** The agents select equipment on behalf of the principals, and the principals pay the energy bill. As a result, the agents may not have an incentive to select efficient equipment. This type of relationship occurs between landlords and tenants.
Agent pays the energy bill	**3:** The principals select the equipment, but do not pay for the energy bill. As a result the principals have no incentive to select efficient equipment or lower their energy use. For example, staff select company cars but do not pay ongoing fuel costs.	**4:** The agents select the equipment on behalf of the principals, and pay the energy bill. As a result, the agents have an incentive to select efficient equipment, but the principals do not have an incentive to lower their energy use. This occurs in hotels.

Source: Derived from IEA (2007a).

Principal–agent problems may entirely insulate some decisions from a carbon price, potentially reducing the adoption of low-emissions options. For example, since residential tenants pay energy bills, landlords may not install energy-efficient appliances (IEA 2007a).

Principal–agent relationships have repercussions throughout the wider market for goods. For example, the new car market dictates which cars are available in the second-hand car market. Therefore, the principal-agent problem that arises from company car purchases could have significant repercussions on Australia's car fleet.

Principals and agents may be able to negotiate to align their incentives more effectively. In the landlord–tenant example above, the rental contract could stipulate that the landlord install a fixed appliance meeting particular efficiency requirements. Principal–agent problems persist when:

- it is difficult to enforce contracts, or
- the costs of negotiating and establishing a better contract exceed the benefits. For example, while residential tenants can attempt to renegotiate leases, offering to pay more rent if landlords improve energy efficiency, the effort of doing so is likely to be substantial (Sanstad & Howarth 1994).

In the Australian rental market, a mixture of principal–agent problems arise. Problems arise with regard to the thermal and energy efficiency of a building: landlords are generally responsible for the purchase and maintenance of fixed appliances, such as water heaters, insulation and air conditioners, and tenants pay the energy bills and are subject to the thermal discomfort. During the period of the lease there is no incentive for landlords to invest in improving the energy efficiency of their properties, even if energy prices rise (IEA 2007a) and temperatures change.

This appears to affect the energy efficiency of the 29 per cent of homes that are rented in Australia (ABS 2007). A survey in South Australia supported this conclusion, finding that, for example, low-flow shower heads were installed in over 42 per cent of owner-occupied households but in only 25 per cent of private rental homes (ABS 2004).

In the commercial sector, industry sources suggest that at least 70 per cent of offices are leased rather than owner occupied. Commercial tenants are generally more aware of energy costs and are often in a better position to negotiate with landlords.

17.3.2 Linking principals and agents

Where possible, principal–agent problems can be tackled directly by fostering new standard contracts that are readily available and better align the interests of principals and agents.

New contracts have been mandated in Japan to tackle problems in the vending machine market (IEA 2007a). Previously, Japanese beverage companies rented space from building owners for vending machines, but building owners paid the electricity bill, resulting in a principal–agent problem of the third kind. To address this barrier, the Japanese Government stipulated that contracts for vending machines should make beverage companies responsible for both selecting the appliance and paying the energy bill. In combination with standards for vending machines, this policy appears to have driven a 34 per cent increase in energy efficiency in vending machines between 2000 and 2005, in contrast to similar but unregulated display cabinets.

The Commonwealth Government has developed 'Green Leases' that set out obligations for landlords and tenants to cooperate in reducing energy and water use (Christensen & Duncan 2007). It demonstrates and promotes the viability of these leases by using them when it leases commercial property or leases out its property to commercial tenants. Other governments should consider similar measures.

17.4 Minimum performance standards

There may be limits to the extent to which providing information can overcome information barriers and improving the links between principals and agents can eliminate principal–agent problems.

In these situations, minimum standards are usually considered to provide some level of protection for individuals and firms. However, they also:

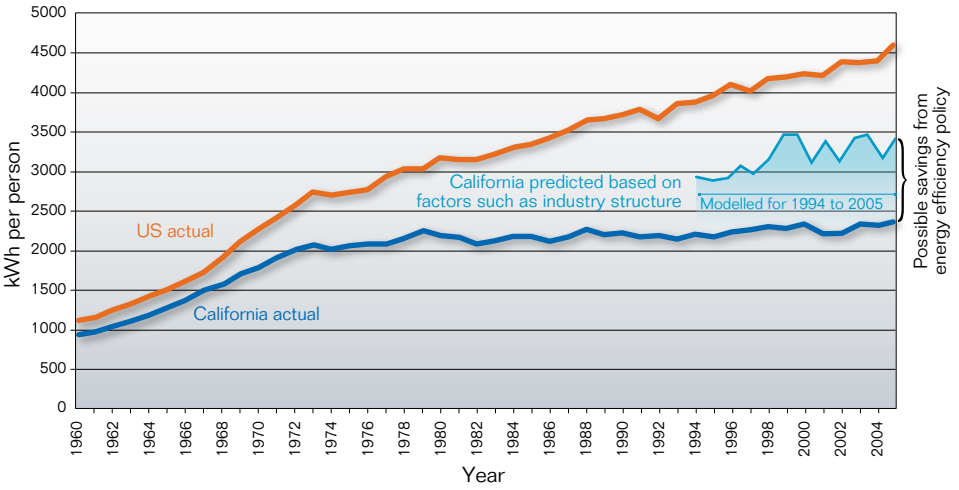
- reduce flexibility
- reduce the opportunity for individuals to make choices
- operate on the presumption that governments are better informed than market participants, both now and in the future.

If standards are designed appropriately, with good knowledge of the costs and benefits and sufficient lead time for industry to respond, experience from both

Australia and abroad has indicated that they can be cost effective in supporting the uptake of low-emissions options (IEA 2007b).

California has been held up as a success story in improving energy efficiency, with electricity sales per capita remaining steady at the same time as output per person grew strongly. Although this is likely to have been partly driven by California's industry structure and higher electricity prices, recent work indicates that energy efficiency policies account for a substantial proportion of the state's successes (Kandel et al. unpublished). Building and appliance standards account for around half of these savings (Geller et al. 2006).

Figure 17.1 Residential per capita electricity consumption in the United States, California and as predicted for California



Note: The area between California predicted and California actual (modelled for 1994 to 2005) indicates possible savings from energy efficiency policies.

Source: Kandel et al. (unpublished).

17.4.1 Approach to minimum performance standards

Given the likely limits on information available to governments, standards should focus on:

- performance rather than specifying a particular technology
- features that are unlikely to affect consumers' amenity, such as energy efficiency, rather than features that consumers may value, such as the size of appliances
- removing poorly performing products, as it will be generally easier to identify the products that are the least cost-effective for the majority of users, than the products that are the most cost-effective options for all parties in all circumstances.

17.4.2 Minimum performance standards for buildings

Existing building standards in Australia

Building standards have been in place in Australia for many years. Historically they have been required to ensure the safety and structural integrity of buildings, though in recent years their scope has broadened to incorporate other issues including disability access.

The primary vehicle for delivery of building standards, the Building Code of Australia, is administered by the Australian Building Codes Board, a joint government and industry body. The code stipulates minimum building standards at the point of construction or major refurbishment, which are required to be met prior to building approval. The code often refers to stipulated requirements for particular building elements and materials established by Standards Australia. The code is administered at a national level, but its standards are brought into law by the states and territories.

In recent years the Building Code of Australia has become a vehicle for supporting greenhouse gas mitigation through the implementation of minimum energy performance standards. Energy Performance Standards were introduced into the code in 2003 for houses (with increased stringency incorporated in 2006), and 2006 for commercial and office buildings.

For houses, these requirements pertain to the heating and cooling energy required to maintain the building's thermal comfort. They refer to the building's fabric only. For commercial and office buildings, the standards have a slightly broader coverage and, in addition to the fabric, include the building's heating, ventilation and air-conditioning systems, as well as lighting.

While the Building Code of Australia adopts 'deemed to satisfy' prescriptive building design standards, flexibility is provided to allow equivalent performance standards to be met in a non-prescriptive manner through the achievement of a particular performance level using allowable design simulation software tools.

The Australian Building Codes Board is undertaking an ongoing work program to ensure that building materials are appropriately resilient to climate change impacts.

Are current building standards adequate?

The standards currently focus on the performance of the building, not particular technologies. They provide flexibility for meeting the minimum standards in a range of ways that impose minimal restrictions on the building's design in regard to materials or aesthetics. They do not force people to reduce the utility of their dwellings by, say, living in a smaller house. Software tools do not discriminate against larger buildings, provided they meet the per area energy performance requirements.

Having said this, some improvements could be made.

First, the standards, particularly for houses, do not include the appliances within the building envelope and therefore fail to guarantee energy performance for the household as a whole. While there appears little reason for incorporating non-fixed

appliances (such as washing machines and refrigerators), which can be switched by occupants, there are strong arguments for incorporating fixed appliances (such as water heaters).

Second, changes in building standards can create uncertainty for industry and increase costs. This can be overcome by providing an indicative pathway for the standards, which may be introduced in the future, to assist the sector in adapting its practices. Such a pathway, updated as new information becomes available, could be a powerful tool for providing information on the implications for buildings of possible future trends in energy prices and implications of projected climate change impacts to developers and building owners, who may not otherwise consider such issues.

In relation to climate change adaptation, it remains to be seen whether the existing approach of enhancing structural performance in the building code is sufficient to ensure buildings will be resilient in the face of future climate change. The challenge will be to achieve reasonable accuracy in the predicted impacts for particular climate zones and locations. Priority should be given to locations most at risk from climate change.

17.4.3 Minimum performance standards for appliances

The National Mandatory Efficiency Performance Standards for refrigerators and freezers were introduced in Australia in 1999 and revised in 2005. This set of standards removes appliances from sale that do not meet minimum benchmarks of energy efficiency. Retrospective analysis in 2006 estimated that these policies saved more than 3000 gigawatt-hours of energy by 2005, savings that were 34 per cent higher than was forecast in the original Regulatory Impact Statements (Energy Consult 2006).

Estimates of the costs and benefits of appliance standards have been contested, particularly in the United States (see for example, Meyers et al. 2002; Sutherland 2003; Nadel 2004). This debate does not suggest that standards are unsuitable, but underlines the importance of using robust methodologies in assessing the benefits of appliance standards and regularly updating standards to ensure that they remain relevant.

There is a risk that applying excessively stringent standards will have consequences for those on low incomes. That is, it may remove from the market products that are attractive for those whom it suits to pay higher ongoing costs rather than higher upfront costs. For this reason, the Minimum Energy Performance Standards scheme for appliances should focus on removing poorly performing products with considerable energy consumption and significant variation in performance, without eliminating features that consumers value.

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