



LOW CARBON LIVING  
CRC

## Best Practice Policy and Regulation for Low Carbon Outcomes in the Built Environment



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## Disclaimer

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## Executive Summary

This study compares and contrasts Australian and global best practices in policy and regulation for the energy and carbon performance of the built environment.

It examines the drivers and opportunities for, and barriers to, the adoption of best practices in Australia.

Finally, and as a stimulus to debate, it proposes a potential set of optimal measures, at national, state/territory and local levels, along with an indicative pathway for their implementation.

### What is best practice?

Our review of best practices in a range of comparable countries – in Europe, North America and the Asia Pacific – suggests the following key features:

- High ambition or stringency – the targeted outcomes are *sufficient* to achieve the underlying objective, which increasingly around the world is framed in terms of carbon neutrality by mid-Century or earlier. Over-achievement is encouraged and rewarded.
- Integrated, coherent and mutually-reinforcing policy packages, rather than single instruments, are used. This includes an integrated approach to standard setting; information disclosure including ratings and certification; compliance and quality assurance; education and awareness raising; financing and consumer protection.
- A pathway or trajectory for policy, and particularly building code, settings into the future is spelled out, to provide certainty for planning and investment, to enable innovation and to encourage and to reward over-achievement (e.g., voluntarily meeting ‘future Code’ standards).
- Building code energy performance standards are set on an as-built basis, with post-construction verification. Standards are updated at regular intervals, of around 3 years, using a statutory, rules-based approach – best practice because it enables the market to predict future Code settings (including the pathway noted above) and therefore to plan and invest with confidence. Codes include at least some provisions that relate to existing buildings, and require older buildings to achieve specific performance outcomes. Renewable energy is fully integrated into the Code.
- Regulations are used to enable market forces. Key examples include mandatory disclosure – an element of best practice in its own right – and market transformation, where a mix of policy measures, and intimate knowledge of product markets, is used to enable markets to deliver high performance outcomes while reducing costs.

- Mandatory disclosure is increasingly viewed as a necessary feature of highly functional building markets. It overcomes the ‘information asymmetry’ between seller and buyer, and enables informed choice when buying or leasing. This in turn provides a powerful yet non-prescriptive market signal that encourages upgrades of the existing building stock. Best practice is continuous disclosure for all building types.
- Policy research, analysis and development are undertaken by institutions that are expert, independent and long-lived, and enabled by a data- and information-rich environment.
- The policy culture and governance arrangements are rules-, evidence- and science-based, with limited discretion and very high standards of transparency. This generates clarity, confidence and repeatability of results.

In Appendix A and in Chapter 4 we describe numerous case studies of best practices at national and sub-national levels.

Europe defines best practice in setting high standards, in its rules-based approach to Code setting, in requiring universal mandatory disclosure, and in providing a wide range of supporting mechanisms and an enabling environment.

North America defines best practice in its institutional arrangements, enabling continuous, professional and expert policy and Code development. Many North American cities are setting high targets and providing comprehensive financial and non-financial support to enable a transformation of building performance.

In the Asia Pacific region, Singapore stands out for its high standards and ambition to achieve net zero outcomes, while China has an ambitious and comprehensive policy framework in place.

### How does Australia compare?

Some aspects of Australia’s policy and regulatory framework for the built environment are best practice:

- The voluntary rating scheme, NABERS, is recognised around the world for generating ratings based on measured, or ‘as built’, performance. Many systems – including NatHERS in Australia, but also ratings used for buildings disclosure throughout Europe – use modelled or estimated values. NABERS is also recognised for its high standards of accreditation and due process.
- The Commercial Building Disclosure (CBD) scheme requires mandatory disclosure of the energy performance of larger office spaces. In residential buildings, only the Australian Capital Territory requires mandatory disclosure of energy performance.

- Many local governments, notably in Victoria, require above-minimum energy (and sustainability) performance standards via their planning schemes, despite a Commonwealth-State/Territory Inter-Governmental Agreement that explicitly aims to limit such actions. This approach withstood a legal review by the Victorian Government in the Victorian Civil and Administrative Tribunal.
- Similarly, many local and state/territory governments are setting ambitious targets, and implementing comprehensive strategies, for greenhouse gas abatement and renewable electricity, which will directly or indirectly improve the carbon performance of the built environment.

Other best practices include government procurement of more energy efficient offices, retailer obligation schemes at state level – at least those that target more substantial savings and pay due attention to the additionality of accredited savings. Some states and territories, however, have none of these measures.

While neither policies nor regulations, industry initiatives such as Green Star provide a voluntary certification process that is highly regarded, while the excellent governance processes and sustainability performance of the leading Australian property trusts are recognised in the Global Real Estate Sustainability Benchmark (GRESB) scheme, *inter alia*.

Within our best policy measures, however, there are important limitations:

- Both NABERS and, moreso, CBD have very limited coverage of building types. CBD only covers larger office spaces, and only then in dedicated office buildings, even though when this measure was first announced (in 2004) it was intended to cover all building types. As a result, these excellent schemes only impact on a small proportion of all Australian buildings.
- Government procurement standards for offices have not been revised for many years, although some jurisdictions currently have them under review.
- Retailer obligation schemes have been criticised for low levels of ambition and additionality in accredited savings, but most have been improved over time.

At the same time, the list of poor policy and regulatory practices in Australia's built environment is long. Amongst them:

- Energy performance standards in the National Construction Code are low – as indicated by studies that show large cost-effective potentials to lift standards – while the Code's objectives (in this field) are unclear and inconsistently applied.
- Standards have not been reviewed or lifted since they were last determined in 2009, and no new standards are planned to be introduced before 2019 and then – at this stage at least – only for commercial buildings.

- Standards are applied 'as designed' with no post-construction verification or quality assurance, and compliance is not enforced.
- There is no forward trajectory or pathway for building standards into the future, which limits the willingness and ability of business to plan, innovate or be recognised for 'future Code' performance.
- The Code upgrade process is infrequent and unpredictable, with no clear or pre-determined rules, allowing significant discretion on the part of officials and decision-makers.
- Mandatory disclosure is highly limited in scope.
- There are few policy incentives, at the national level, to upgrade the performance of the vast bulk of existing buildings. The Emissions Reduction Fund can in principle provide financial assistance, but there is no data to suggest this is occurring. The Clean Energy Finance Corporation invests in energy efficient/low carbon buildings, but with interest rates at record lows in Australia, access to finance is not a major barrier.
- There are no market transformation initiatives in place for building (or indeed other) products at the national level.
- The once-active and successful minimum energy performance standards and labelling program has produced no new standards for a number of years, reflecting highly restrictive regulatory impact assessment and offsets policies, that have effectively stifled this highly cost-effective abatement activity.
- There is a lack of investment in policy research, development, analysis and administration, and an absence of dedicated and expert institutions. This encourages a leisurely pace of policy, tool, standards and program development and implementation.

One commentator summarised these points as 'the lack of a national project management approach to policy and regulatory development and implementation'.

### Drivers and opportunities

There are strong drivers and numerous economically-attractive opportunities to move towards global best practices in the policy and regulation of the built environment in Australia.

The opportunities include the significant potential for energy efficiency improvement, estimated to be at least 50% by 2050.<sup>1</sup> Other studies have shown that net zero housing, and even high-rise apartments, are already cost effective, while many commercial building forms can, with integrated

<sup>1</sup> ASBEC, *Low Carbon High Performance*, April 2016, p. 61.

renewable energy, achieve 80% to 100% purchased energy savings.<sup>2,3</sup>

These results reflect the low stringency of existing standards, the long period of time since standards were last updated, unprecedented energy prices rises in the period since, and ongoing improvements in the performance, and reductions in the cost, of building efficiency technologies, designs and construction techniques. Further, low standards and a lack of market transformation initiatives mean that there is very considerable potential to fully commercialise and reduce the costs of global best practice building technologies, which are currently confined to high-cost, niche markets in Australia.

In addition, the dramatic and ongoing reductions in the cost of solar and other renewable energy sources is creating increasingly large and cost effective opportunities to reduce energy cost and emissions. This report cites evidence, for example, of utility-scale solar generation at less than 1/3rd of the cost of gas combined cycle generation, and less than 1/10th of the cost of coal fired generation with carbon capture and storage.

The drivers for adoption of best practices include improving consumer welfare and business competitiveness by reducing building-related energy consumption costs. The residential and commercial sectors directly consume 456 PJ and 336 PJ of energy per year respectively, valued at many billions of dollars. Household electricity prices in Australia have doubled or more than doubled in some jurisdictions since 2008, although they have tended to stabilise in the last few years. Depending upon the price observation used, gas prices have increased by between two or four-fold over the same period.<sup>4</sup>

In addition, climate change presents three important drivers for policy and regulatory reform in the built environment.

First, it demands greater thermal integrity in our building stock, to safeguard public health and to improve resilience to heat-waves and other climate change impacts.

Second, it is increasing the demand for cooling energy, and therefore peak loads, in many climates (although this may be offset to some degree by reduced heating requirements in other climates). However, electricity system costs are driven by peak, and not average, loads.

Third, higher peak energy demand, and the need to shift to zero carbon generation – including making security investments in storage and smart power/grid management – will likely maintain pressure on energy prices, creating further

economic incentives for efficiency improvement and investment in embedded generation.

Climate change also requires that we set building performance standards using ratings tools that anticipate the future, more severe, climate, and not tools that assume a continuation of past climate conditions: that option is no longer available.

## Market and policy failures

This report reviews the enduring features of the built environment that are often characterised as market failures. While we find this language unhelpful, market failures are increasingly considered to be the *prima facie* justification for potential policy interventions. Market failures in this sector are many and well documented, including information asymmetries, principal-agent barriers (such as the tenant landlord split), bounded rationality and more. As noted, major externalities such as climate change, and the public good characteristics of buildings – that in many ways are akin to long-lived infrastructure – provide further rationales for policy makers to act.

However, policy failure may be at least as material a consideration as market failure in Australia's built environment. The market failures noted above are not new, although new information about the severity of climate change is accumulating every year. Increasingly, therefore, the failure to act appropriately – to 'internalise the externalities' – appears to be a conscious policy choice on the part of governments. Yet ASBEC and ClimateWorks have estimated that:

*Just five years of delay in implementing the opportunities in buildings could lead to \$24 billion in wasted energy costs and over 170 Mt of lost emission reduction opportunities.<sup>5</sup>*

The same report notes that a further five years of delay (to 2025) would see these figures increase to \$43 billion in wasted energy costs and 397 Mt of unnecessary greenhouse gas emissions. No-one has yet calculated the opportunity costs already imposed on the Australian economy by the decisions not to update the National Construction Code in 2013 and again in 2016, or indeed with other missed policy opportunities.

## Mind the gap

What explains the gap between Australian and best practice policies and regulation for the built environment?

In Chapter 3 we note that Australia's relatively mild climate, history of low energy prices, limited energy security concerns, and limited general knowledge (or need to know) about

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<sup>2</sup> pitt&sherry, *Accelerating Net-Zero High-Rise Residential Buildings in Australia*, August 2016.

<sup>3</sup> pitt&sherry, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards*, January 2012.

<sup>4</sup> [http://www.aph.gov.au/About\\_Parliament/Parliamentary\\_Departments/Parliamentary\\_Library/pubs/BriefingBook45p/EnergyMarket](http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook45p/EnergyMarket)

<sup>5</sup> ASBEC/ClimateWorks, *Low Carbon, High Performance: how buildings can make a major contribution to Australia's emissions and productivity goals: summary report*, May 2016, p. 15.

building efficiency, help to explain our history of low energy performance standards and outcomes. While many of these factors have already been overtaken by events, this current reality is not reflected in policy and regulatory settings – many of which are simply out of date.

Increasingly, the key barriers to an energy efficient and low carbon built environment in Australia are:

- government preferences to limit (or reduce) regulation in almost any form and regardless of the social benefits it can deliver;
- a reduced reliance on science and evidence as the basis of determining policy targets and instrument choices;
- the inability of a succession of national governments to respond adequately to the challenges of climate change – a factor which many attribute to human cognitive biases that affect our behaviour in profound, but often unrecognised, ways.

### Toward best practices in Australia

In Chapter 7 we set out a potentially optimal suite of policies and regulations at national, state/territory and local levels, with the aim of stimulating and focusing discussion on potential reform options.

We argue there is a critical leadership role for the national government that in many ways is not currently being played. As a direct result, there is an increasing diversity of policy targets and settings at state and territory and local levels. While some will decry the lack of policy consistency, this aspect of Australia's competitive federalism at least limits the opportunity costs associated with failures in national policy settings. The situation begs the solution of stronger national leadership, but also of a more co-operative and integrated approach to policy-making across the tiers of government. Reformed policy governance and institutions will be central to this project.

A best practice policy framework for Australia will fully comprehend and integrate the key drivers of change that will be at work in the future policy environment: climate change, low-cost renewable energy and storage, technological innovation, and changing population demographics and societal expectations. It will achieve consistency between related policy domains: buildings policy, energy market policy, climate policy and innovation policy.

Most importantly, a best practice policy framework for Australia will be evidence-based and science-based – a factor that highlights the key role of the research community in enabling such an approach.

In that context, key elements of a best practice framework could be as set out below.

#### National level

1. National emissions targets – for the short, medium and longer terms – that are science-based and consistent with

the Paris Climate Agreement; that is, reaching net zero emissions by around the middle of the Century and, importantly, keeping within Australia's global carbon budget at all times before then.

2. A comprehensive, transparent and evidence-based strategy that details how the national emissions targets will be met in the short, medium and longer terms, including the key policies and measures that will be used in all sectors, including the built environment.
3. Effective carbon pricing. While carbon pricing may have limited *direct* impacts on efficiency choices in the buildings market, it will have very significant impacts on the optimal fuel mix and therefore on carbon outcomes. If carbon is not priced, for example, building owners in higher carbon states and territories may be tempted to invest in gas as a way of achieving modest carbon savings relative to high-carbon electricity; however, doing so could lock in fossil fuel use for the life of the investment, and potentially lock out the renewable energy that is required to reach very low or zero emissions overall. Sending accurate market signals, via carbon pricing, will be important to achieve an optimal balance between renewable energy, gas options such as co- or tri-generation, and grid-based power.
4. Trajectories to net zero emissions for new and existing buildings over time that are consistent with meeting the above targets and which are set using a transparent, repeatable and rules-based approach. This will enable business to plan, innovate and invest with confidence and certainty.
5. For all new buildings, energy performance standards that are reviewed and potentially updated every three years, using an agreed and statutory methodology and process, targeting the highest cost effective outcomes (a benefit cost ratio of 1) – such that stock turnover effects can do much of the work of transitioning the built environment to net zero by 2050. The National Construction Code would be given effect by national legislation – as per the Greenhouse and Energy Minimum Standards Act 20126 – to limit poorly-justified state/territory variations (exclusions), while local applicability would be ensured, as now, by applying performance requirements by climate zone, and not by state/territory.
6. To ensure quality and compliance, performance requirements would be set on an as-built basis and verified via post construction measurement. All buildings (including newly-constructed/refurbished ones) would be covered by mandatory disclosure requirements, to ensure that consumers and owners are well informed about actual, as distinct from modelled, energy performance. Other modernisation reforms would be implemented for the Code, including updating building types and reducing the number of separate performance requirements by

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<sup>6</sup> It is possible that this Act could be amended for the purpose.



building type to the greatest degree possible – a verified performance/outcomes based approach would enable simplification of the Code, while also making compliance much easier to demonstrate.

7. Also for new buildings, over-compliance with minimum performance requirements will be encouraged, including through the use of on-site or contracted off-site renewable energy (additional to nRET), a universal mandatory disclosure scheme, government procurement of above-minimum standard offices (and event venues, accommodation, etc.), and performance trajectories that enable and encourage developers to attain next/future Code performance levels – an approach as known as ‘stretch code’ or ‘beyond code’.
8. For the existing building stock, cost-effective opportunities to include ongoing performance requirements in the NCC should be implemented, such as mandatory audits and plant upgrades for commercial buildings at regular intervals (not exceeding 10 years).
9. Enhanced carbon performance for existing buildings would be encouraged primarily, at the national level, by mandatory disclosure, which should be continuous (annual) for non-residential buildings, while for residential buildings, a building passport would enable discovery of key documentation including energy assessments and compliance reports. For rental properties (which are effectively commercial buildings), minimum energy performance standards will be developed.
10. A national energy savings target and white certificates/retailer obligation scheme – to replace and expand upon existing state- and territory-based schemes. Best practice elements will include higher savings targets, consistent national application and rules, wide coverage of sectors – essentially expanded to cover at least the residential and small-to-medium sized commercial sectors, with primarily project-based and co-investment methodologies (no give-aways) that are only available where deeper cuts in energy use are achieved – such as significant retrofits that save at least 10% of a building’s, household’s or enterprise’s annual energy consumption, and equity considerations such as a primary focus on low-income households and social housing.
11. To enable higher energy performance standards to be achieved cost effectively, key building elements would be targeted with market transformation initiatives designed to increase the availability and reduce the cost of best practice technologies. These should at least include high-performance glazing, heat recovery ventilation systems,
12. At the same time, minimum energy performance standards (MEPS) and labelling would be expanded to cover all major building components. As with building performance standards, these MEPS and labelling provisions will be reviewed and potentially updated every three years using a rules-based statutory process and seeking a benefit cost ratio of 1. A high efficiency performance standard (HEPS) would be set for each

product, providing a ready benchmark for above-code or stretch-code purposes.

13. The statutory process for Code and building product performance standard setting would anticipate expected reductions in compliance costs due to learning and technology development effects, and also take into account expected future climate conditions.
14. The Australian Government would review and implement all feasible opportunities to create an enabling environment for energy efficiency/carbon investment and information transparency. This could include tax incentives, such as accelerated depreciation, for very high efficiency (HEPS) components and retrofits. It could also extend to national enabling legislation to support environmental upgrade agreements being offered in all local government area.
15. To underpin these outcomes, the national government would create a dedicated, permanent and public interest buildings research institution charged with applying the agreed statutory process for standards updates, data gathering and publication, undertaking techno-economic research to support market transformation policy development and to quantify and anticipate learning rates, and other functions as required. This institution should have as much independence from the government of the day as practically possible, including an independent board and levy-based or other hypothecated revenue sources. The culture of a ‘national project management approach’ to policy development and delivery would be instilled via this body and supportive governance arrangements.
16. The national government would also seek to achieve an integrated, coherent, strategically-aligned, complementary and co-ordinated set of policies and measures between jurisdictions, via enhanced officials and Ministerial-level arrangements. Since there are doubts about the timeliness and quality of past decisions by the COAG Energy Council, it is likely that significant changes in current administrative and decision-making arrangements will be needed if there is to be effective, rapid and co-ordinated action on buildings, energy and climate policies in the short term.
17. Noting the structural vertical fiscal imbalance between jurisdictions, this governance structure should also oversee national government funding of agreed building policies and measures at subnational level – state, territory and local.
18. The Australian Government would recognise the public good nature of data and therefore create as much data transparency as is possible regarding the nature of energy use and emissions and structural change in the built environment – to inform research and the energy services market – including by requiring disclosure of data held by its own agencies, but also energy businesses and market regulators, at the highest level of spatial and temporal disaggregation possible while protecting privacy and necessary confidentiality. This may require legislative

amendment to make it clear that information may be collected, used and disclosed for public interest research purposes, as was recommended by the 2008 Australian Law Reform Commission review.<sup>7</sup>

#### State and Territory Level

1. Setting above-minimum performance requirements, or including additional performance elements that jurisdictions believe are justified in their circumstances – which may include actions to compensate for any failure by the Australian Government to update national Code performance requirements or other key buildings policy settings, but also local considerations such as water availability/use efficiency. Below-minimum outcomes or trade-offs would not be permitted, as minimum energy performance requirements would already have been optimised as noted above.<sup>8</sup>
2. Ensuring effective planning of infrastructure, regions, cities, precincts, and individual buildings/developments, either directly or via enabling legislation for and collaboration with local government<sup>9</sup>, including to:
  - ensure appropriate master planning of new developments, including integrating locational and sustainable transport considerations in addition to those relating to buildings themselves, such as appropriate block/building orientation and solar passive performance
  - enable building-based or precinct-scale renewable energy supply
  - limit over-shading and preserve solar access for buildings
  - limit urban heat island effects via appropriate management of albedo, green cover/shading and heat rejection sources (e.g., ventilation, cooling towers, etc.)
  - optimise use of local resources (such as suitable rivers/water bodies as heat sinks)
  - fully integrate infrastructure investment decision making with local planning schemes and strategies, to ensure that the overall character of development encourages a low carbon footprint.
3. Designing and delivering incentive and market transformation programs tailored for the specific characteristics of the building market in each

state/territory. While such programs could be at least partially funded by the Australian Government – reflecting vertical fiscal imbalance, but also to enable a degree of consistency – they should be designed and delivered locally to effectively target the different building techniques, industry contexts and capabilities (see below), climate zones and other factors that differ from state to state. These state-based initiatives should be co-ordinated with national ones to avoid duplication. This would mean only developing state-based initiatives where there is an expectation that important and cost-effective outcomes will not be achieved by national-level initiatives alone. This opportunity is closely linked to the next below, as targeted incentives and market transformation programs – along with awareness raising and training – may be necessary to respond adequately to particular local building industry practices – such as double-brick construction in WA, for example.

4. Promoting a culture of excellence in energy/carbon performance, including quality assurance for functions regulated/delivered by states such as licensing, registration and accreditation arrangements for building professionals; industry education and training; community information, awareness-raising and continuous professional development. This would focus on ensuring that intended regulatory outcomes are delivered effectively and efficiently; that, as a result, consumer welfare and environmental quality are protected; and that industry and the community are well-informed on issues relating to the energy and carbon performance of the built environment.
5. Modelling appropriate behaviours and stimulating demand for above-minimum performance outcomes through procurement policies, which could be co-ordinated with local governments, major corporates and other jurisdictions for maximum impact.
6. Within the context of a national white certificates scheme, developing specific methodologies that are relevant to the particular circumstances and needs of individual states and territories. These may include the local fuel mix, which may give rise to a need to apply specific fuel-switching measures, for example, or local construction practices/legacy building stock, which may require specific refurbishment/retrofit strategies.
7. Providing for transparency of key data, to enable effective policy development and analysis and to inform energy service providers. States hold much data that would help researchers and energy service providers to improve the quality of policy advice and analysis, and to better target abatement opportunities, by publishing as much of this data as is possible, e.g., through generic data websites, as some states and territories already do. Many data sets would hold significant value, including data on the specific nature and turnover of the building stock in each state (including area of new build, demolitions and major refurbishments annually), and government energy/building use and fuel intensities, *inter alia*.

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<sup>7</sup> Australian Law Reform Commission, *For Your Information: Australian privacy law and practice*, 2008, p. 124.

<sup>8</sup> Recalling that where unique provisions are able to be justified on the grounds of local climatic conditions, these provisions would be delivered in relevant climate-zones via a climate-adapted Code, with no variation being required.

<sup>9</sup> Noting that the relative roles of state/territory and local governments with respect to planning functions varies widely around Australia.



## Local Level

1. Leadership at local level on carbon abatement action, through setting targets and creating detailed strategies to achieve those targets; engaging with stakeholders and the community; and creating a supportive environment for low-carbon innovation at the local level. Particularly while national and some states policy signals on carbon remain conflicted or unclear, there is a key role for local government to 'look through' the noise and focus on simply taking effective action, to continue to share the results widely with other councils, and to continue to take inspiration from best practices at local level from around the world.
2. Setting above-minimum standards for energy/carbon performance at the local level, and encouraging excellence in carbon performance – e.g., zero carbon precincts as well as buildings.
3. Community education and engagement. Councils are uniquely situated to influence local community attitudes and behaviours over time through strategies such as consistent messaging, information provision, structuring local fees and charges to consistently incentivise sustainable choices, and taking high-profile action to counter inappropriate development – hence reinforcing with the wider community the commitment to sustainable development choices.
4. Responsible and enabling planning environments, including strategic planning at the LGA level and master planning of precincts that encourage low- and zero-carbon built environments, including minimising urban sprawl and car dependence, maximising synergies between transport infrastructure and urban development, embedding passive solar design into all new and re-developments, preserving solar access<sup>10</sup> and minimising barriers to low-impact forms of renewable energy (such as PV) in the urban environment, countering urban heat island effects and offer multiple benefits through urban trees and greenery, encouraging active and public transport options (for example by providing bike and scooter lanes, bus lanes, shaded footpaths, etc.), providing electric vehicle infrastructure, and encouraging industrial ecology and efficient use of local resources and many others.
5. Modelling appropriate behaviours and stimulating demand for above-minimum performance outcomes through procurement policies, which could be co-

ordinated with neighbouring and regional councils, state governments and local businesses for maximum impact.

6. Providing for the maximum transparency in data access while preserving necessary privacy and confidentiality – for public interest research and energy service provision.

## Moving forward

Practically we could hope for a three-step approach to moving forward, reflecting the 'national project management approach' noted above:

1. In the short term, identifying and implementing reforms and enhancements to *all* existing national measures, with the aim of maximising their cost-effective impact. This would extend to setting minimum outcome expectations for all initiatives in the National Energy Productivity Plan, including a clear trajectory for the National Construction Code, while addressing complementary initiatives in the National Energy Market. In the context of the other two actions below, this action would amount to the Australian Government getting its own house in order.
2. A medium term process of engagement with states and territories, with local government and with the wider community (and not only industry) to propose a thorough reshaping and rationalisation of the overall policy framework nationally, to reflect the best elements of Australian as well as international practice. This cannot happen before Step 1 above, as jurisdictions will not be willing to alter their policy settings in the absence of national leadership.
3. Designing and implementing the longer term processes of market transformation that will enable a rapid transition to the low- and zero-carbon built environment of the future, while maximising economic and social benefits. In practice, this could and should occur in parallel with those above.

Opportunities to make progress in these directions in the near term are many, including at least:

- the National Energy Productivity Plan
- the Climate Change Review 2017
- the Finkel Review into the Future Security of the National Electricity Market.

We hope that this study can provide some useful ideas and precedents to assist in this endeavour.

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<sup>10</sup> With renewable energy being increasingly critical to affordable energy service provision, there is a risk that owners and tenants of buildings with poor solar access will face increasing hardship and energy poverty risks. At a minimum, councils should ensure that all new developments have good solar access themselves and do not impact negatively on the solar access of others.

## 1. Introduction

### Background

The Co-operative Research Centre for Low Carbon Living (CRCLCL) is a national research and innovation hub, supported by the Co-operative Research Centres (CRC) program, that seeks to enable a globally competitive low carbon built environment sector in Australia.

CRCLCL has a focus on collaborative innovation, and brings together property, planning, engineering and policy organisations with leading Australian researchers. It develops new social, technological and policy tools for facilitating the development of low carbon products and services to reduce greenhouse gas emissions in the built environment.

Amongst its key strategies, the CRC aims to deliver ‘an evidence base for good planning and policy’ and, through this and other strategies, to help Australia achieve deep greenhouse gas emission reduction goals.

At the same time, the CRC is focused on creating economic opportunities by lifting the efficiency and productivity of the built environment sector, supporting lower-carbon manufacturing, reducing risks, and developing tools, technologies and techniques that will ensure that Australia’s \$150 billion per year construction industry remains globally competitive.<sup>11</sup>

Against this background, this project focuses on the CRC’s mission of helping to provide an evidence base for good planning and policy. In particular, it examines the global and domestic policy and regulatory landscapes in the built environment, with the aim of identifying:

- What amounts to global best practice, including what determines whether a given policy can be said to be best practice or not?
- Is there a gap between global best practices and Australian practices, and to the extent that there is, why is this so?
- What would be the opportunities associated with closing any policy gap, including economic, social and environmental benefits?

### Research Brief

Specifically, this project has five key aims, *vis*, to:

1. Identify the different ways in which policy and regulation affect carbon outcomes in the built environment

2. Describe the policy and regulatory landscape in Australia (relating to the built environment)
3. Describe the policy and regulatory landscape in a range of comparable countries
4. Draw out the similarities and differences in how policies and regulations are being used to pursue the objective of low carbon in the built environment in Australia and in comparable countries
5. As a basis for debate and possible further research, draw conclusions and identify an idealised suite of policy and regulations, considering all three levels of government in Australia.

The findings of this report will be presented at a CRC LCL National Forum.

### Scope

Recognising that many policies impact on carbon outcomes in the built environment, the report focuses primarily on *building* policies and regulations, and specifically those that impact on energy use in buildings. Small appliances found in buildings – often referred to as ‘plug load’ – are excluded from consideration. Where relevant, the report also touches on policies and regulations, such as energy market regulations and planning schemes, which affect precinct-scale infrastructure such as transport and local energy supply systems. However, these are not the main focus.

The brief specifies that:

*Policy and regulation means government interventions that set both mandatory and not mandatory rules, standards and initiatives that encourage particular behaviours. “Policy” refers to the overarching principles and suite of initiatives being adopted, whilst “regulation” refers specifically to initiatives that are mandated and limit the discretion of individuals and agencies, or otherwise compel certain types of behaviour. In most cases, to achieve the desired outcomes, a suite of policy initiatives is likely to be needed, with some of these being regulatory.*

As noted, the project considers policy and regulation administered at national, state and local levels. However, it does not aim to catalogue all such policies. Similarly, it is beyond the scope of this project to provide a detailed or comprehensive evaluation of any particular policy or regulation, in Australia or elsewhere. Rather it aims to highlight key examples of policies primarily for the purpose of illustrating broader aspects of good policy and regulatory design. The policy case studies documented in appendices include references and links that may be used by those seeking more information on a particular policy.

Also, the project does not aim to quantify the economic value of moving towards global best practices, although such a project could be useful in helping to make the case for policy change. Potentially, such a study could be considered for a later time.

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<sup>11</sup> <http://www.lowcarbonlivingcrc.com.au/about-us>, viewed 5/12/2016.

## Process and Timelines

The project commenced in early October 2016 and will culminate in a National Forum in the first half of 2017. While primarily a research paper, the project involves some consultation with key organisations in the building sector, government, university and private sector members of the CRC.

A project Steering Committee was formed comprising:

- Deo Prasad, CEO CRCLCL
- Sandy Holloway, Deputy Chair, CRCLCL
- Chris Derksema, Manager – Sustainability, City of Sydney
- Cristien Hickey, Office of Environment and Heritage, NSW
- Miranda Lello, Federal Department of the Environment and Energy
- Stanford Harrison, Federal Department of the Environment and Energy.

A roundtable discussion was held in Canberra on 1 November 2016, with senior officials from the Department of the Environment and Energy and AusIndustry. Attendees included:

- Virginia Toller, DEE
- Alison Reeve, Director, Mitigation Policy Section, Domestic Emissions Reduction Division, DEE
- Stanford Harrison, Director, Commercial Buildings Section, Energy Division, DEE
- Gene McGlynn, Assistant Secretary, Community Energy Efficiency Programs, AusIndustry
- Jodie Pipkorn, Director, Residential Buildings Section, Energy Division, DEE.

A panel discussion on the topic was held at the 15/16 November 2016 CRCLCL Annual Forum. Participants in the discussion included:

- Jonathan Cartledge, Green Building Council of Australia
- Nik Midlam, Manager – Carbon Strategy, City of Sydney
- Professor Per Heiselberg, Danish Energy Commission
- Philip Harrington (project manager).

## Structure of this Report

Chapter 2 summarises the *problematique*; that is, what are the key issues in the policy and regulation of the built environment, primarily in Australia, but noting that many of the issues are global in nature.

Chapter 3 analyses how policies in the built environment work, or at least are intended to work, from a theoretical, economic and public policy perspective. It also provides a

simple taxonomy of policy instruments that is used throughout the report.

Chapter 4 describes key policies and regulations used in comparable countries to influence carbon outcomes in the built environment. Case studies including further references are captured in Appendix A.

Chapter 5 describes key elements of the policy landscape in Australia. As noted, it embraces all three tiers of government in Australia, and some fields related to and impacting on the built environment and its carbon performance. However, it does not aim to provide a comprehensive catalogue of policies and regulations at all tiers of government.

Chapter 6 offers a comparative analysis of the policy landscapes in Australia and comparable countries, and seeks to draw out the opportunities in moving towards best practices in Australia. It also addresses a number of specific questions posed in the research brief.

Finally, Chapter 7 describes a theoretical optimal suite of policies for low carbon outcomes in Australia, as a basis for debate and the targeting of possible future research.

## 2. Policy and Regulatory Drivers in Australia's Built Environment

This Chapter describes the *problematique* addressed in this research; that is, what are the key issues associated with policy and regulation in the built environment in Australia? What are the enduring characteristics of buildings that might suggest that policy and/or regulation could be needed to influence carbon and energy performance at all?

### Scale and Complexity

The built environment has been broadly defined as "...the buildings and all other things constructed by human beings".<sup>12</sup> Other definitions include "...the man-made surroundings that provide the setting for human activity, ranging in scale from buildings and parks or green space to neighbourhoods and cities, that can often include their supporting infrastructure, such as water supply or energy networks".<sup>13</sup> Not surprisingly, then, the built environment is a vast, extensive construct. In Australia, it is where we all live and work, it is where every business operates, it's our towns and cities, and it's our transport and infrastructure connections.

Even if we limit the focus primarily to buildings, as we do for the most part in this report, the scale of the sector is indicated by the fact that the total value of construction work done in the residential and non-residential construction sectors in Australia, in the 12 months to end-September 2016, was estimated at over \$109 billion.<sup>14</sup> The construction sector's contribution to GDP in the same period was over \$99 billion.<sup>15</sup> Employment in building construction and construction services in August 2016 stood at 1.01 million.<sup>16</sup>

The physical scale of the built environment also ensures that the system that generates the laws, policies and regulations that apply in the built environment is equally large and complex. Policies impacting on the energy performance of buildings and precincts are made by 560 local governments, 8

states and territories and the Australian Government. A degree of co-ordination is achieved through the Council of Australian Governments (COAG), but building regulation is generally held to be a state power under the Constitution. The states have a history and practice of making their own building policies and, as detailed in Chapter 5, there remain significant differences in buildings policy between states (and some local government areas). This issue is expanded upon in Chapter 5 – The Australian Policy Landscape.

In terms of energy consumption and greenhouse gas emissions, remarkably there is no definitive data source to indicate Australian totals for these values. The residential sector is reasonably well resolved<sup>17</sup> and is indicated to have consumed 455 PJ of energy in 2014-15, equivalent to 7.7% of total energy consumption. However, the figure excludes primary energy consumption to generate electricity which is consumed in the residential sector. 'Commercial sector' energy consumption, as reported in Australian Energy Statistics (AES), includes all energy consumption by businesses and organisations classified as 'commercial' under the Australian and New Zealand Standard Industry Classification system, and not only commercial building energy consumption.<sup>18</sup> There is no reliable data source for the latter. As reported, commercial energy consumption is a further 336 PJ or 5.7%, generating a combined total of 13.4% of primary energy consumption. However, residential and commercial together consumed 55% of all electricity supplied to final customers in Australia in 2014-15, while electricity generation in turn accounted for nearly 42% of total energy consumption. Drawing on the AES, we estimate that residential and commercial sectors accounted for 54% of Australia's total greenhouse gas emissions in 2014-15, although this will include some end uses that are not directly related to buildings, such as water pumping.<sup>19</sup>

Around the world, the International Energy Agency notes:<sup>20</sup>

*Buildings are the largest consumers of energy worldwide and will continue to be a source of increasing energy demand in the future. Globally, the sector's final energy consumption doubled between 1971 and 2010 to reach 2 794 million tonnes of oil equivalent (Mtoe), driven primarily by population increase and economic growth. Under current policies, the global energy demand of buildings is projected to grow by an additional 838 Mtoe by 2035 compared to 2010 (IEA, 2012a), which is equivalent to the total current energy demand of the buildings sector of the United States and China combined.*

<sup>12</sup> Collins English Dictionary online, viewed 13 December 2016:

[https://www.collinsdictionary.com/dictionary/english/the-built-environment#the-built-environment\\_1](https://www.collinsdictionary.com/dictionary/english/the-built-environment#the-built-environment_1)

<sup>13</sup> [https://en.wikipedia.org/wiki/Built\\_environment](https://en.wikipedia.org/wiki/Built_environment), viewed 13 December 2016.

<sup>14</sup> Australian Bureau of Statistics, *8755.0 Construction Work Done, Australia, Preliminary – Table 06. Value of Building Work Done, by Sector, Current Prices, Australia, 2016.*

<sup>15</sup> Australian Bureau of Statistics, *5206.0 Australian National Accounts: National Income, Expenditure and Product, Table 6. Gross Value Added by Industry, Chain volume measures, 2016.*

<sup>16</sup> Australian Bureau of Statistics, 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly – Table 04. Employed persons by industry division of main job (ANZSIC) – Trend, Seasonally adjusted and Original.

<sup>17</sup> Electricity consumption in Class 2 (apartment) buildings can be reported as 'commercial', as tariffs are load-based, rather than sectoral, and larger apartment buildings can have similar load profiles to commercial buildings.

<sup>18</sup> ANZSIC Divisions F, G, H, J, K, L, M, N, O, P, Q, R, S and the water supply, sewerage and drainage service industries.

<sup>19</sup> Based on Australian Government Office of the Chief Economist, Australian Energy Statistics: 2016 update, p. 9.

<sup>20</sup> IEA, *Modernising Building Energy Codes – to secure our global energy future, 2013*, p. 8.

*Buildings will therefore add substantial pressure on primary energy supply, if further policy action is not taken at a global level to improve their efficiency.*

*In most IEA member countries, buildings currently account for more than 40% of primary energy consumption. The residential sub-sector remains the largest consumer of energy at a global level, and the non-residential sub-sector has increased its share since 1990, especially in emerging economies.*

Finally, the scale of the building and construction sector in Australia is important from the perspective of political economy – if policy and regulatory proposals by government are opposed by this industry, it is able to wield considerable influence on government decision-making. This is discussed further below.

## Market Failures

In Australia, and for a number of decades at least, the making of public policy has been bound up in the idea of market failure. Our starting point assumption is that markets deliver optimal outcomes unless it can be proven convincingly otherwise. COAG *Best Practice Regulation* Guidelines note that:<sup>21</sup>

*In some cases government intervention in a market may be justified on the basis of 'market failure', which can arise where there is:*

- *imperfect competition;*
- *externalities;*
- *public goods; or*
- *imperfect or costly information.*

Merely establishing that there is a market failure is not sufficient to justify a policy or regulatory intervention, as this and other guidelines apply additional tests, including the materiality of the issue or failure in question, whether a policy measure could make a material difference and, if so, whether it would be cost-effective to do so. Still it is necessary, if not sufficient, to demonstrate market failure, in particular for regulatory policies that trigger regulatory impact assessment.<sup>22</sup>

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<sup>21</sup> COAG, *Best Practice Regulation: a guide for ministerial councils and national standard setting bodies*, October 2007, p. 10.

<sup>22</sup> Note that the COAG *Best Practice Regulation* Guidelines “...apply to agreements or decisions to be given effect, whether at the Commonwealth or State/Territory level, or both, through principal and delegated legislation, administrative directions or other measures which, when implemented, would encourage or force businesses or individuals to pursue their interests in ways they would not otherwise have done. This does not include purchasing policy or industry assistance schemes.... Development of voluntary

So what is defined as a market failure? Definitions generally refer to market outcomes in which the allocation or distribution of resources (capital, labour, materials) is not efficient. Wikipedia usefully clarifies that this means that ‘...there exists another conceivable outcome where an individual may be made better off without making someone worse off’.<sup>23</sup> If we assume for a moment that the anthropogenic language used here is not intended, and if we replace ‘an individual’ with ‘society’, which we define as including the natural world upon which society and its economies depend (implicit in the idea of ‘externalities’), then market failure is any market outcome that fails to optimise welfare in a very broad sense.

Market failures in the buildings area are very well documented. They have been treated in past regulation impact assessments; they were treated by Ross Garnaut in his 2008 *Climate Change Review*<sup>24</sup>; and they have been discussed at length in UNEP’s *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings*.<sup>25</sup> The 2009 Regulation Impact Assessment for commercial buildings identifies the key market failures or barriers as:<sup>26</sup>

1. Climate change externalities – current and projected future damage costs that are not represented in current energy or factor prices;
2. Negative externalities in the electricity market – examples cited include a lack of price signals regarding the economic consequences associated with the time-of-use of electricity and peak demands;
3. Split incentives – noting that the developer, owner and occupier of buildings are often different parties, which often means that costs (associated with higher energy performance) accrue to one party, while

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codes and other advisory instruments should take account of these principles and assessment requirements where there is a reasonable expectation that their promotion and dissemination by standard-setting bodies or by government could be interpreted as requiring compliance.” (p. 3); in addition, there are separate *Best Practice Guidelines* that apply to Australian Government regulation impact assessment.

<sup>23</sup> [https://en.wikipedia.org/wiki/Market\\_failure](https://en.wikipedia.org/wiki/Market_failure), viewed 2 February 2017.

<sup>24</sup> Garnaut *Climate Change Review*, 2008, Cambridge University Press. Chapter 17, pp 403 – 422.

<sup>25</sup> S. Koeppel & D. Urge-Vorsatz, *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings*, UNEP/Central European University, September 2007, produced for the United Nations Environment Program Sustainable Buildings and Construction Initiative.

<sup>26</sup> Australian Building Codes Board/Centre for International Economics, *Final Regulation Impact Statement for Decision (RIS 2009-7): proposal to revise the energy efficiency requirements in the Building Code of Australia for commercial buildings – classes 3 and 5 to 9*, December 2009, pp 34 – 38.



benefits accrue to another party, resulting in less than optimal investment in energy efficiency improvement from a societal perspective;

4. Information failures/asymmetries/adverse selection – examples cited include uncertainties about how long the current owner will occupy the building; future energy prices (that will affect the payback on investment in energy savings); and amenity preferences. The point is made that it is time consuming and expensive to collect such information. It also notes that most people will not possess the specialised knowledge required to make optimal decisions;
5. Capital constraints – access to capital is critical as many energy efficiency investments require additional capital upfront and deliver benefits only over time – some argue that longer term paybacks on some energy efficiency investments, and a lack of understanding within the financial community of projects that save energy, amounts to a market failure or barrier;
6. Early mover disadvantage – this barrier relates to the risks associated with innovation and early adoption of new technologies. Such technologies are may have both high pricing – associated with (or justified by) the need to recoup research and development costs, for example – and technical limitations or at least risks, associated with the technologies relative immaturity;
7. Transactions costs – a common example are the additional search costs involved in acquiring and analysing information on complex or unfamiliar energy efficiency solutions;
8. Monopolies and market power – where individual firms are able, through market share, or ownership of a propriety technology, to extract rents or super-profits, including by limiting supply.

The ACIL Allen review of the Commercial Building Disclosure scheme also contains a comprehensive analysis of market failures in the buildings sector. In addition to those listed above, it notes that more than 25 sources of 'behavioural failures' have been documented in economic literature including:<sup>27</sup>

- *computational issues (limited attention, decisional conflicts, over-optimism and over-confidence, self-serving bias, limited analytical capacity including bounded rationality and rule of thumb (heuristic) decision-making)*

- *self-control issues (time inconsistency, procrastination, temptation, channelling and framing)*
- *preference issues (reference-dependent preferences including endowment effects, status quo bias and loss aversion, outward looking or other-regarding preferences including altruism, fairness concepts and social norms).*

*Bounded rationality has been suggested as a reason why buyers do not undertake discounted cash flow calculations, preferring to fall back on rules of thumb, before deciding on an energy efficiency investment. It appears that very few purchasers and lessees of commercial properties undertake detailed research and analysis regarding energy efficiency features, due in part to the costs associated with searching for this information. In addition, net present value calculations may be beyond the competence of many purchasers and lessees. It is even less likely that more sophisticated analysis would be undertaken to allow for uncertainties regarding future energy prices, actual fuel efficiency and the effect of energy efficiency features on re-sale values, tenure and future refurbishments. However, it should be noted that bounded rationality suggests poor valuation of energy efficiency, not pervasive under-valuation.*

*Loss aversion and salience have been put forward as reasons why extra up-front costs of buildings and appliances with better fuel efficiency appear to be given more weight than energy savings over the life of the investment. Framing through advertising could help explain why buyers give less attention to energy efficiency than other features of commercial accommodation.*

UNEP (2007) and many other references use the term 'market barriers' interchangeably with the term market failures. However, as the COAG Best Practice Regulation Guidelines warns (p. 10),

*The term market failure is sometimes misunderstood to indicate a failure of markets to deliver a desirable social or equity goal.*

Further, the term 'market barriers' is not well defined, and barriers commonly cited often do not amount to market failures, even if they may refer to undesirable market outcomes from certain perspectives. For example, UNEP described economic/financial barriers as "...one of the most important barriers for energy efficiency in buildings" (p. 7) because,

*Purchasing more efficient equipment usually involves higher first costs which many consumers do not want to spend and which low-income consumers cannot afford because they have limited capital.*

But there is no market failure here. The facts that some things cost more than others and therefore must be financed, that consumers have limited budgets, and that some consumers are less wealthy than others, are entirely normal aspects of a market economy. They affect the marketability of many if not all products. Economists would argue that if

<sup>27</sup> ACIL Allen, Review of the Commercial Building Disclosure Scheme, 2015, pp 11 – 15.

poor income distribution is agreed to be a matter of public policy concern, for example, then optimal policies – like progressive taxation and income redistribution schemes – should be used rather than intervening in all product and service markets. This is because such policies would achieve the desired outcome at lower economic cost.

UNEP goes on to note (*ibid.*) that “...consumers often...don’t know or don’t believe that energy efficiency investments usually pay back in a few years or even months”. This could amount to an information market failure. The energy efficiency performance of a building is not transparent to a prospective purchaser, unless that purchaser possesses expert knowledge, which is rare, or is sufficient aware of the consequences of poor energy efficiency – such as the extra energy costs they will face over their period of ownership in the services market. Also, the owner or landlord of an inefficient building, who has learned over time of the negative consequences of its poor energy efficiency, has a strong incentive to conceal this information from prospective buyers or tenants, as it would reduce a rational buyer’s willingness to pay. This is the market failure of information asymmetry. Further, in the absence of policy instruments like mandatory disclosure, twenty prospective (and aware) buyers or lessees would need to pay for twenty energy assessments for the same building, dramatically increasing the transaction costs associated with its sale.

In a similar vein, UNEP refers to ‘political and structural barriers’, with examples including the length of time required for governments to make legislation, income and policy inequalities between regions, poor enforcement of standards, a lack of incentives and others. The COAG Best Practice Regulation also (briefly) acknowledges the existence of ‘regulatory failure’ (which it defines as ‘unintended consequences or failure of existing regulation’). These are discussed further in Chapter 3, as they relate more to the business of government and the criteria, often implicit, that are applied in the public policy process.

Despite its ubiquity in the policy process, the language of market failure is in many ways unhelpful. It sets up a largely false conflict between an ideal of frictionless, perfectly-informed markets populated with rational actors and disembodied from the natural world, from the finiteness of natural resources, from the creation of wastes and from any irreversible consequence, including climate change or species extinction, for example, on the one hand, and the real world, on the other hand. While the phrase ‘market failure’ appears to concede that it is the market that is failing, and not the real world, in fact, acknowledging the reality of a market failure requires that we accept that our market model is not perfect, but rather that it is flawed and in fact often fails to represent how the world is. For those who believe strongly in the power of markets, such a concession – and the need to make policy or regulation to correct the failure – carries a psychological cost, and many resist doing so. In fact, as noted above, we reverse the burden of proof, and require someone – for no-one in particular has ‘standing’ in this regard – to

prove that there is a failure before even conceding that there might be a *prima facie* case for intervention.

This conflict-laden and rather ideological construct is unhelpful and risks to obscure underlying realities. The attributes of the built environment, and the human behaviours that we can observe in it, are not failures – they are largely inherent properties that, to make efficient and effective public policy, we need to understand and work with, rather than dismiss or seek to define away. What are these inherent properties?

## Public Good/Infrastructure Aspects of Buildings

Buildings – and even more so, the planning aspect of precincts and cities, including building orientation and overshadowing aspects – are long-lived assets or phenomena. The economic life of buildings varies greatly, but is often assumed to be 50 years for a residential building, and 40 for a commercial building. Over these periods, many owners and many tenants will occupy these buildings. For commercial buildings in particular, the function of the building may also change over time (e.g., from office to apartment building to hotel). Yet economic decisions by the original owner of these buildings – reflecting their personal preferences and budget constraints – will in some cases influence the energy costs incurred by all of the subsequent owners and tenants, none of whom participated in the original design and construction decisions. While buildings are changed and renovated over their lives, these processes are often cosmetic and do not influence the building’s energy performance, while key performance drivers – such as the building’s orientation, design, window-to-wall ratios, construction materials, air tightness and difficult-to-access insulation (walls, floors, some ceilings) – are more difficult and expensive to change – and would rarely be cost effective to do so.

In this way, buildings are akin to infrastructure and have public good (or bad) aspects. Infrastructure investments are consciously designed to be suitable for a wide range of unknown, including future, users. Of course, such judgements can never be perfect – some commuters would have preferred the bridge to have been built closer to their home, and a road to a local factory may be little used after the factory closes down – but the design brief for these infrastructure assets implicitly or explicitly would have included maximising their benefits for all users whose needs can be envisaged. No such considerations are present for buildings – except to the extent that building codes or other policies are designed with these considerations in mind, and we return to this in Chapter 3.

A particular aspect of the public good (or bad) nature of a building is its energy performance – particularly, as noted above, the ‘deep’ or passive performance elements noted, such as design, orientation and materials, that are not easily or cost-effectively changed. While the future purposes to which a building may be put, and the preferences of future owners and occupants, cannot be perfectly predicted, there are universal aspects that can be agreed. For example, all future owners and occupants will be better off if the building delivers a high standard of thermal comfort without

consuming large quantities of (costly) energy, if natural light is able to substitute for artificial light, and if the building is well ventilated without a high energy cost penalty. Over the whole life of the building, the cumulative value of avoided energy costs – and externalities such as climate change – are likely to be very significant. However, these factors may not have been valued by the initial owner, and for reasons that were entirely rational from that owner's perspective, such as limited capital or borrowing capacity.

Arguably then, the public good aspects of buildings require regulations that represent the interests of those parties who have a (future) interest in key design and building quality decisions, but who are not yet identified or able to represent their own interests directly, as well as the interests of those parties impacted by the external consequences of those design and quality decisions, which include all those impacted by climate change, for example. These regulations may not align perfectly with the preferences of the original owner, but from a societal perspective, the preferences of (and consequences for) others impacted by the original owner's decisions should also be considered. This can only occur if these wider preferences and interests are represented in the market via public policies, including regulations.

### **The Climate Change 'Externality'**

Lord Stern, in the *Stern Review Report on the Economics of Climate Change*, famously noted that,

*Climate change is ... the greatest and widest-ranging market failure ever seen.* (p. i)

and

*Greenhouse gases are, in economic terms, an externality: those who produce greenhouse-gas emissions are bringing about climate change, thereby imposing costs on the world and on future generations, but they do not face the full consequences of their actions themselves.* (p. xviii)

In principle, the way to 'internalise' this external cost is to place an appropriate price on carbon, so that the decisions that occur in markets effectively take into account the external costs. As Stern notes, this can be achieved through regulation, and not only taxes or trading schemes:

*Putting an appropriate price on carbon – explicitly through tax or trading, or implicitly through regulation – means that people are faced with the full social cost of their actions. This will lead individuals and businesses to switch away from high-carbon goods and services, and to invest in low-carbon alternatives.* (p. xviii)

Also, we should not assume that merely because a country has a carbon price (or regulatory framework in place), these policies adequately internalise the externality. A key question that must be asked, given the reality of climate change, is whether the policy incentives are *sufficient*. Stern notes,

*The social cost of carbon is likely to increase steadily over time because marginal damages increase with the stock of GHGs in the atmosphere, and that stock rises over time.*

*Policy should therefore ensure that abatement efforts at the margin also intensify over time. But it should also foster the development of technology that can drive down the average costs of abatement; although pricing carbon, by itself, will not be sufficient to bring forth all the necessary innovation, particularly in the early years.* (p. xvii)

In Australia, and following the Garnaut Climate Change Review, there has been a singular, and arguably excessive focus, on carbon pricing as the primary – some would say only – policy instrument required to respond to climate change. But Stern notes,

*Three elements of policy for mitigation are essential: a carbon price, technology policy, and the removal of barriers to behavioural change. Leaving out any one of these elements will significantly increase the costs of action.* (p. xviii)

Stern notes that because climate change impacts will be long term and potentially irreversible, the analytical framework brought to bear on this challenge must have 'the economics of risk and uncertainty at centre stage, and examine the possibility of major, non-marginal change' (p. i). While carbon pricing does create incentives to invest in the development of new, carbon-saving technologies, including building energy efficiency,

*... investing in new lower-carbon technologies carries risks. Companies may worry that they will not have a market for their new product if carbon-pricing policy is not maintained into the future. And the knowledge gained from research and development is a public good; companies may under-invest in projects with a big social payoff if they fear they will be unable to capture the full benefits. Thus there are good economic reasons to promote new technology directly.* (p. xix)

This speaks to the need for an appropriate mix of policy measures, where each targets a specific market (or regulatory) failure or barrier efficiently. Stern does use the 'barrier' language, noting:

*Even where measures to reduce emissions are cost-effective, there may be barriers preventing action. These include a lack of reliable information, transaction costs, and behavioural and organisational inertia. The impact of these barriers can be most clearly seen in the frequent failure to realise the potential for cost-effective energy efficiency measures. Regulatory measures can play a powerful role in cutting through these complexities, and providing clarity and certainty. Minimum standards for buildings [emphasis added] and appliances have proved a cost-effective way to improve performance, where price signals alone may be too muted to have a significant impact.*

Many of the barriers to an economically efficient level of energy efficiency in buildings are *non-price* in nature. For example, the tenant-landlord split incentive is related to ownership and tenure, and hardly affected by price considerations (except in the extreme – for example, very high carbon pricing would increase the (probability-weighted)



value to a tenant of negotiating with a landlord for efficiency upgrades, even in the absence of market power or negotiating leverage on the part of the tenant). Reasonable ranges of carbon pricing are likely to have very little impact on efficiency outcomes in commercial and tenanted residential buildings, with large opportunity costs in terms of foregone economic welfare. At the same time, a simple and low-cost regulatory change – such as mandatory disclosure, or legislating to change the nature of contract provisions that currently disempower tenants – could be highly effective and significantly improve overall economic welfare, while also reducing the climate change externality.

Arguably, owner-occupied buildings – at least where the owner intends to occupy the building over the longer term – should not face this split incentive, and therefore we should be able to find evidence of higher energy efficiency in such buildings. A limited study of the energy performance of the office market in Sydney by ownership class in fact found that owner-occupied office buildings have below-average energy efficiency.<sup>28</sup> Potential reasons for this are explored further in Chapter 3.

In concluding this section, we note that if it is necessary to describe market failures to justify public policy, then in principle we should have few difficulties making policy in the built environment. That this is not true indicates that in fact we are applying other criteria, and bringing other values, to the decision-making process. This is not surprising because, of course, the model of disembodied perfect markets is at best an ideal. In reality, we make policy decisions embedded in human, social, historical, cultural and environmental realities. Acknowledging these factors could potentially lead to policy decisions being made that respond more appropriately to the reality of the challenges that face us. We review at least some of these factors below.

## Historical and Cultural Factors

We noted above that buildings, precincts and places have long-lived characteristics. They also have unique historical and cultural contexts. Sydney and Hobart differ as cities for many reasons, including their respective climates, population density and scale. But they also differ because the two societies and their decision-makers have, over decades and centuries, had differing priorities, functional requirements, aspirations, economic circumstances – and also governance arrangements and regulatory provisions – that together have shaped the urban form in each place. An historical and cultural perspective can therefore help to illuminate why Australia has the building stock that it does today.

Mild climate

When considering global climate diversity, the climatic

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<sup>28</sup> pitt&sherry, *Office Sector Emissions Modelling Foundation Final Report*, October 2016, prepared for the City of Sydney, pp 10 - 13.

differences between Sydney and Hobart are trivial if we also include Edmonton, Oslo or Reykjavik on the same scale. All Australia's major cities experience a climate that is mild by global standards. With possible exceptions in the country's interior or in high mountain locations, few building owners or occupants in Australia face life-threatening consequences if their buildings have low standards of thermal performance. This is particularly true if, again using a global standard, the average Australian is relatively well-off and can afford the cost of heating and cooling – or at least could do, on the energy pricing that prevailed a decade ago.

Low energy prices

Australia has traditionally, over the last 50 years at least, had relatively low energy prices, again on a global scale.<sup>29</sup> When combined with our mild climate, which generates a modest demand for energy for thermal comfort purposes when compared with other countries, then it is unsurprising that we have not perceived a need for high performance buildings. Indeed, we could argue that – if it were not for climate change and for the significant upward revision in energy (and particularly electricity and gas) pricing that we have witnessed over the last decade – it would have been economically irrational for Australia to have very high building standards – if heating and cooling could have been purchased at a lower cost.

Of course, higher energy prices and climate change – both its current and, more so, projected future impact on the severity of the climate and the consequent need for higher standards of thermal performance for buildings, and also the need it brings to transition to low- and zero-carbon sources of energy to power our buildings – fundamentally change this equation. However, from a cultural perspective, it would appear that the scale and urgency of the required changes are not yet fully apparent or widely accepted. Our climate remains relatively mild (with increasing but still limited exceptions such as heatwaves and increasingly wildfire risk), and we have developed social responses to the problem known globally as 'energy poverty', or a lack of affordability of energy services, such as consumer protection provisions in the National Energy Law and social security systems.

Energy security

For some countries, notably traditional energy-importing nations including Japan, the United States and many

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<sup>29</sup> Sources vary widely – presumably based on methodological differences – as to where Australia currently ranks in international electricity price comparisons. Compare <https://www.energycouncil.com.au/analysis/worldwide-electricity-prices-how-does-australia-compare/> and <http://cmeaustralia.com.au/wp-content/uploads/2013/09/160708-FINAL-REPORT-OBS-INTERNATIONAL-PRICE-COMPARISON.pdf> for example, both viewed 3 February 2017.

European nations, energy security is a primary concern and matter of national security. For example, a major report by the International Energy Agency and United Nations Development Program notes:<sup>30</sup>

*Natural gas is the main primary energy source used for heating in the buildings sector in IEA member countries, and gas imports used for the buildings sector place a significant burden on many IEA economies (e.g. at the European Union (EU) level, total gas trade deficit represented 41% of the total trade deficit with the rest of the world in 2010). As a consequence, the inefficient use of energy in the built environment undermines energy security and increases dependency on unsustainable fuels.*

For energy exporters, including Australia, energy security concerns, while present, are not accorded the same priority. Our energy security concerns focus on crude oil supply, where shortages occur only infrequently. Such concerns do not create a significant driver for energy conservation or efficiency in Australia.

#### Knowledge limitations

Aspects of our social capital – such as the general population’s, but also decision-makers’, awareness of and detailed knowledge about climate change, and knowledge about the thermal performance of buildings – do not change rapidly, particularly in the absence of specific and targeted public education and information campaigns. Importantly, the knowledge capital in the building and construction industry also does not change rapidly. A major study by the Swinburne University of Technology, in association with pitt&sherry, found that “...people [building industry participants] simply do not know what they don’t know”, due to “...uneven availability and quality of information and training resources, together with uneven access and commitment to ongoing professional updating”. They also found “...a ‘satisficer’ culture in segments of the construction industry, in which minimal compliance is all that is aspired to”. They concluded, however, that “The provision of information and training alone will not bring about the desired changes in the satisficer segments of the industry. Information and training are but one dimension in a complex policy mix of legal/regulatory, economic and social strategies that together are needed to provide the conditions for appropriate cultural and behaviour change”.<sup>31</sup>

Since cultural factors – as well as the physical reality of urban form – evolve on a timescale of decades and centuries, it is perhaps not surprising that we have been and remain slow to respond to a changing physical reality. The 2009 National Strategy on Energy Efficiency noted “Historically, our

buildings have not been built with energy efficiency as a key concern”, although at the time it was felt that measures “...initiated over the past decade have begun to transform our built environment”.<sup>32</sup>

Still, there is an extent to which current market outcomes in Australia’s built environment represent learned responses to conditions that applied and were relevant in decades past, but which have since – and some time ago now – materially changed. Responding adequately to the challenge of climate change is the most fundamental of these changes. A deliberate, systematic, comprehensive and sustained effort, led by governments, would be required to recondition our policy and regulatory regimes, but also our mindsets, to a new set more attuned to the current and emerging climate and market realities.

That this has not yet occurred, at least on any significant scale, brings us to a final – and possibly sensitive – set of cultural considerations, and that is Australia’s apparent cultural resistance firstly to regulation, in almost any form, but secondly and specifically to regulation justified primarily or in part on the grounds of climate change.

#### Attitudes towards regulation

The Council of Australian Governments (COAG) defines regulation as:<sup>33</sup>

*...the broad range of legally enforceable instruments which impose mandatory requirements upon business and the community, as well as to those government voluntary codes and advisory instruments for which there is a reasonable expectation of widespread compliance.*

While COAG’s Best Practice Guide concedes that regulation is ‘an essential part of running a well-functioning economy and society’, it warns that it:<sup>34</sup>

*...must be carefully designed so as not to have unintended or distortionary effects, such as imposing unnecessarily onerous costs on those affected by the regulations or restricting competition. Assessing the impact of regulation, including analysing the costs and benefits, is therefore important to ensure that it delivers the intended objective without unduly causing adverse effects.*

These are reasonable tests. Indeed, one might expect that they would be applied to all government actions, policies and decisions, including Budget and tax expenditures, grants, financial assistance and others. But in fact, they are only required to be applied to regulation. Indeed, the 2007 Guide makes it clear that it is ‘working from an initial presumption

<sup>30</sup> International Energy Agency/UNDP, Modernising Building Energy Codes – to secure our global energy future, 2013, p. 8.

<sup>31</sup> pitt&sherry and Swinburne University of Technology, National Energy Efficient Building Project: Final Report, November 2014, p. xx.

<sup>32</sup> COAG, National Strategy on Energy Efficiency, July 2009, p. 22.

<sup>33</sup> COAG, Best Practice Regulation: a guide for ministerial councils and national standard setting bodies, October 2007, p. 3.

<sup>34</sup> Ibid, p. 7.

against new or increased regulation',<sup>35</sup> and this anti-regulation sentiment has grown stronger over the years. The 2014 Australian Government Guide to Regulation specifies that:<sup>36</sup>

*Regulation should not be the default option for policy makers: the policy option offering the greatest net benefit should always be the recommended option.*

Indeed, the Guide specifies that regulation should be '...introduced as a means of last resort'.<sup>37</sup> It is unclear in its advice in the situation where, of the policy choices available, regulation offers the greatest net benefit.

We can be confident that the reluctance to regulate – at least in the area of the carbon and energy performance of the built environment – is not based on evidence of poor regulatory outcomes. The National Energy Productivity Plan reflects on outcomes of the 2015 Independent Program Review, noting:

*... it is contributing over \$1 billion in avoided energy costs to the Australian economy annually, while avoiding carbon emissions by an estimated 11.6 million tonnes per annum. Projections of the impacts of the current suite of E3 Programme measures for the period 2014-2020 in Australia, developed by the Department of Industry, Innovation and Science, show a Net Present Value in the range of \$3.3 - \$7.3 billion; and a Benefit: Cost Ratio in the range of 1.7 – 5.2 based on only the energy bill savings, over the period 2014-2020. Emissions savings over the same period are estimated to be 60-70 million tonnes CO<sub>2-e</sub>. This represents greenhouse gas abatement at a net negative cost, substantially reducing the economic costs to Australia of meeting its national greenhouse targets.*

Some express concern that, despite these achievements, there may nevertheless be hidden costs, such as higher appliance prices or reduced product choice for consumers, or that the findings of regulation impact statements (RIS) may be over-stated. However, such concerns are not evidence-based. A 2011 evaluation of the MEPS and labelling program by George Wilkenfeld – which marked the program's 25<sup>th</sup> year – concluded:<sup>38</sup>

- *The cost-effectiveness of regulatory action ... was significantly higher than originally projected - about twice as much energy was saved by householders at less cost than projected in the RISs.*
  - *...there appears to have been a consistent conservative bias in past RISs.*

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<sup>35</sup> Ibid, p. 4.

<sup>36</sup> Australian Government, *The Australian Government Guide to Regulation*, ISBN 978-1-922098-35-1 (PDF), 2014, p. 5.

<sup>37</sup> Ibid, p. 3.

<sup>38</sup> E3 Program, *Retrospective Review of the E3 Program: lessons learnt from two reviews*, March 2011, pp 4 -5.

- *There is no evidence that the real price of appliances increased at all as a result of the rise in energy efficiency. The assumption that the Australian public will pay a higher price for energy efficient goods is not borne out by experience.*
- *There was no evidence of a reduction in the number of brands or models available, or any other evidence of reduced market competition as a result of the rise in energy efficiency imposed by regulation.*

Despite this, the 2015 Review noted that "...no new regulations have been put to the [COAG] Energy Council for decision since [the regulatory offsets] policy came into effect".<sup>39</sup>

Similarly, with building codes being recognised around the world as the most important single opportunity to influence the carbon and energy performance of the built environment, we note the singularity of Australia's decision to leave in place building standards determined in 2009 until 2019 at least, with a current prospect that residential building standards may remain unchanged until at least 2022.<sup>40</sup> This outcome is unprecedented in the OECD, and is more remarkable when it is recalled that energy prices in Australia have increased at an unprecedented rate over this period, which has the effect of significantly increasing the economic benefits associated with energy savings.<sup>41</sup>

The emergence of anti-regulatory sentiment has deep and complex roots, and is well-critiqued in books such as Tony Judt's *Ill Fares the Land* and, as part of the 'efficient markets hypothesis', in John Quiggan's *Zombie Economics*.<sup>42,43</sup> While

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<sup>39</sup> Ibid, p. 56.

<sup>40</sup> A member of the Australian Building Codes Board staff announced, at a Conference in November 2016, that the Board has determined that there is no case for changing the residential building performance requirements in 2019. We note, however, that the *National Energy Productivity Plan – Work Plan* declares, under the heading *Advancing the National Construction Code*, that "...there are very likely strong productivity and emissions reductions benefits in further revising energy efficiency requirements in building codes for both residential and commercial buildings" (p. 20, emphasis added). The current state of play is that "The Council will engage in an intensive research programme to inform development of updated building efficiency requirements." The outcome of this research remains to be seen.

<sup>41</sup> The Parliamentary Library has determined, "In real terms—that is, taking into account the general increase in prices across all goods and services—prices for households increased on average by 72% for electricity and 54% for gas in the 10 years to June 2013." Viewed online at [http://www.aph.gov.au/About\\_Parliament/Parliamentary\\_Departments/Parliamentary\\_Library/pubs/BriefingBook44p/EnergyPrices](http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook44p/EnergyPrices) on 2 February 2017.

<sup>42</sup> T. Judt, *Ill Fares the Land*, The Penguin Press, London, 2010.

the general phenomenon is beyond the scope of this project to explore, clearly it is relevant for a project examining optimal options for policy and regulation for carbon outcomes in the built environment. At a minimum, it should be uncontroversial to conclude that there is not a level playing field when it comes to the selection of optimal policy instruments for carbon outcomes in Australia's built environment, and that policy instrument choices are not being made on the basis of evidence.

Yet there are alternative perspectives on the role of regulation. The new book, *Still Lucky: why you should feel optimistic about Australia and its people*, by Rebecca Huntley, offers the perspective that:<sup>44</sup>

*On the whole, Australians seem to be more pragmatic than ideological when it comes to government power. If we are generally convinced about the importance of any outcome...the tendency is to say, "Make me do it. If you want me to stop using plastic bags because of the environment, just ban them".*

This may reflect a similar though- process to one that has been ascribed to Japan, where market regulation is stronger than in Australia. It has been noted that Japanese companies operating in Australia respond poorly to voluntary incentives, yet readily comply with mandatory regulations. A Japanese company executive once explained to the author that this was because voluntary compliance would be discretionary, risking criticism of the exercise of that discretion, whereas mandatory standards are seen as the proper exercise of the government's responsibility to govern in the wider national interest.

In the Australian culture, with its egalitarian roots if not present<sup>45</sup>, there may be a similar recognition that regulation can deliver equity - I will be more inclined to accept a perhaps-inconvenient additional effort if I know that everyone else is being asked to make the same effort, regardless of their wealth, social status or any other factor.

Climate scepticism, or optimism bias

The Australian Government Guide to Regulation notes that 'There are a relatively small number of situations that justify direct government intervention in the form of regulation' – these are listed as market failures, regulatory failures and unacceptable hazard or risk.<sup>46</sup> The Paris Climate Agreement

– which has 194 countries as signatories including Australia<sup>47</sup> – states that:

*...climate change represents an urgent and potentially irreversible threat to human societies and the planet and thus requires the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions*

Prima facie, this would appear to fall within the definition of 'unacceptable hazard or risk'.

The Guide to Regulation asks policy makers to consider 'What are the genuine consequences of no action?'.<sup>48</sup> It should be clear that the answer to this question, in the case of climate change, is that we risk catastrophe if we take no effective action. Yet as noted, Australia's response – and in particular its willingness to regulate – does not appear proportionate to the scale of the hazard posed. This may reflect scepticism about the science of climate change which, despite years of refutation, remains embedded in parts of the population. However, in the economic literature, another explanation is offered – *optimism bias* and related cognitive biases.

Optimism bias is the well-documented tendency of humans '...to underestimate the likelihood that they will experience adverse events, such as skin cancer or car accidents. As a consequence of this bias, some individuals might disregard precautions that might curb these risks.'<sup>49</sup> This source noted that 'optimism bias tends to be amplified when the risky event transpires infrequently'. If the threats associated with climate change are perceived in terms of extreme weather events, such as wildfire or flooding, and our personal experience of these events is that they are infrequent, then optimism bias will tend to diminish our assessment of the risks of climate change. Other psychological factors are cited as explanators of our reluctance to act on climate change. Weinstein, who is attributed with first exploring the phenomenon of 'unrealistic optimism', argued that contemplation of events with severe consequences '...will promote defensive processes, such as denial...individuals are more motivated to deny their susceptibility to consequential events, as a means to maintain their wellbeing'.<sup>50</sup>

George Marshall's book, *Don't Even Think About It*, explores this literature in depth. He notes that our equation of climate change with extreme weather events causes us to recall, from our personal experience, that storms and heatwaves and floods, no matter how severe and frightening, pass. The next day, 'You look out the window and, hey, it's a beautiful

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<sup>43</sup> J. Quiggan, *Zombie Economics: how dead ideas still walk among us*, The Princeton University Press, New Jersey, 2010.

<sup>44</sup> Viking Press, 2017.

<sup>45</sup> *The Spirit Level: why equality is better for everyone*, R. Wilkinson & K. Pickett, Penguin, 2010, highlights that since the 1950s, Australia has moved from being one of the most equal to one of the least equal societies in the world, based on a number of different indicators.

<sup>46</sup> Ibid, p. 15.

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<sup>47</sup> [unfccc.int/paris\\_agreement/items/9444.php](http://unfccc.int/paris_agreement/items/9444.php), viewed 2 February 2017.

<sup>48</sup> Australian Government (2014), p. 16.

<sup>49</sup> Dr Simon Moss, Optimism Bias, viewed online at <http://www.sicotests.com/psyarticle.asp?id=238> on 2 February 2017.

<sup>50</sup> Ibid.



day'.<sup>51</sup> Relatedly, he notes that the full import of climate change – aspects such as the large-scale extinction of species, the displacement and suffering of human populations, damage to food production systems and to fresh water supply – ‘...is not readily imaginable.’ Therefore, ‘...even though it involves so many of the characteristics of dread and unknown risk, climate change does not *feel* frightening unless you actively *choose* to see it that way’ [emphasis in original].<sup>52</sup> Marshall, referring to the work of Professor Daniel Kahneman, notes that climate change lacks *salience*:<sup>53</sup>

*...threats that are concrete, immediate and indisputable – for instance, a car out of control driving right at you. By contrast, climate change is...abstract, distant, invisible and disputed.*

This is offered by Marshall as just one of a myriad of cognitive biases that together explain why we fail to take climate change seriously.

#### Political Economy

Another important explanation for the reluctance to act to limit emissions is the political economy – the tight linkages between the economic interests of powerful individuals, corporations and sectors, and the political decision-making process. As noted above, the building and construction sector is very large, generating around \$100 billion in value added and employing over 1 million persons, while the fossil fuel based energy industry in Australia is larger and more powerful again. Both sectors are well organised to represent their financial interests politically, with a large number of active industry associations and the potential to mobilise extensive advertising budgets. Key building associations, including the Housing Industry Association and Master Builders Australia, have long opposed energy performance regulation of buildings.

An important example is offered by the major consultation and research process that was undertaken by COAG officials over the 2011 to 2013 period, aimed at articulating a ‘Pathway to 2020’ for energy performance regulation in Australia. This process arose from the 2009 National Strategy on Energy Efficiency (NSEE). Measure 3.1.1 of the Strategy called for “...a consistent, outcomes-based national framework for energy standard-setting, assessment and rating for both commercial and residential buildings”. The framework was to include a regulatory pathway under which energy standards would be “...reviewed and periodically increased, for example every three years”.

The *Draft Framework for Consultation Paper*, released in May 2012, noted the key objectives of the process as follows:<sup>54</sup>

*The Framework [aims to] provide a clear, coordinated and visionary approach to increasing the energy efficiency of Australia’s buildings for the following reasons:*

- *to address key market failures in the building sector, such as information barriers where information on the performance of buildings is not available or hard to interpret, and the split incentives that exist between building developers, owners and tenants;*
- *to reduce regulatory burdens on industry and increase productivity by ensuring that building energy efficiency standards and the systems used to assess and rate buildings are well designed, transparent, nationally consistent and clearly communicated to industry and the community;*
- *to enhance the ability of industry to plan ahead and develop innovative, practical and cost effective energy efficiency solutions, which will also lower compliance costs for households and businesses; and*
- *to prepare the building sector for changes to building standards that will be necessary to assist in broader efforts to reduce carbon emissions and adapt to predicted future climate conditions and more extreme weather events.*

An initial scoping study, *The Pathway to 2020 for Low-Energy, Low-Carbon Buildings in Australia: Indicative Stringency Study*, was undertaken by Pitt & Sherry in 2010, followed by a full benefit cost analysis, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards: Benefit Cost Analysis: Final Report*, published in January 2012. Extensive face-to-face consultations were held in all states and territories. However, the process never proceeded to the stage of a Regulation Impact Assessment, let alone implementation. Indeed, the Draft Framework was never issued as a Final. Australia has now missed two 3-yearly regulatory cycles – there were no proposals actively considered for either 2013 or 2016, and a process is now underway, for commercial buildings only, to review performance standards for potential change in 2019 – although there has been as yet no political commitment to making a stringency change for 2019.

While no public explanation was ever offered as to why, this COAG-led process ceased sometime in 2013. However, the context included strong opposition from key stakeholders, including the Master Builders Australia and the Housing Industry Association. It is understood that there was also a lack of agreement between states and territories about strategic directions, and – unlike in the lead-up to BCA2010, which was driven very largely by the Australian Government – an absence of such leadership.

<sup>51</sup> G. Marshall, *Don’t Even Think About It: why our brains are wired to ignore climate change*, Bloomsbury, 2014, p. 54.

<sup>52</sup> *Ibid.*, p. 55.

<sup>53</sup> *Ibid.*, p. 57.

<sup>54</sup> Energy Efficiency Working Group of the Select Council on Climate Change, *Draft Framework for Consultation: national building energy standard-setting, assessment and rating framework*, May 2012, p. ii.

Even though the political economy is a reality in all countries, including those acting more vigorously than Australia to limit greenhouse gas emissions, it seems likely that political economy remains a key explanator of the reluctance of governments to regulate to improve the energy performance of buildings. A deeper exploration of this phenomenon, including an analysis of the veracity of grounds used to oppose energy performance regulation of buildings, is beyond the scope of this project.

## Conclusion

Our conclusion is that the decision-making process that we bring to the policy making, while systematised and couched in ostensibly value-free, economic language – such as the language of market failures – is in fact far from objective, evidence-based or value-free. It is intrinsically embedded in a social and political context, in which human foibles and biases are ever-present, and in which regulatory options in particular are required to clear hurdles that other policies,

and indeed the status quo (which includes existing regulations), are not. While the framework is capable of allowing wider issues to be considered during the decision-making process – provided we can couch them as market failures and externalities that are material – creating at least the potential that it will lead to outcomes that are optimal from the wider perspective of society and the planet, this is far from guaranteed. There is a clearly stated antagonism towards regulation at the national level, while the issue of climate change appears to trigger emotive rather than rational responses. Using regulatory policy to address climate change is therefore a double challenge, even when the evidence suggest this is the optimal approach. In recognition of this situation, it is important that the research community in particular consistently calls for evidence to be the basis upon which decisions are made about policy instrument choice, and as the basis for planning future responses to the challenge of climate change.

### 3. Policy Instrument Choice

#### Policy Classification Framework

This chapter describes in a theoretical and analytical manner the range of policies and regulations that are available to influence carbon outcomes in the built environment. We note that no classification framework can neatly comprehend the ways in which all policy instruments work. Policy interventions draw on elements of the framework to varying degrees, and there are many hybrid measures and combinations of measures that defy neat classification.

That said, the following represent important dimensions or attributes of policy measures in the built environment:

- how they are *given* effect – mandatorily or non-mandatorily
- how they *take* effect or work in practice – including direct and indirect effects (which can also include intended and non-intended effects)
- who they impact upon (and to what degrees) – e.g., consumers, market intermediaries, producers
- the values they work with and appeal to – financial/extrinsic, non-financial/intrinsic.

We use the term ‘theory of action’ to summarise the above performance dimensions for particular policy measures.

We do not resolve a class of ‘economic’ or ‘market-based’ measures: these are further value-laden terms that can obscure how measures are in fact taken effect and having an impact. Specifically, these terms are commonly used to contrast with regulation. However, most measures described as economic or market based rely fundamentally upon and could not work without regulation. Further, many regulations aim to and do create market signals, and are deliberately used to work transformations in markets. Finally, some economic and market-based instruments – such as taxes – are often overlooked by those extolling the virtues of market-based measures. The terms therefore unhelpful in either classifying measures or analysing how they work.

The framework in Table 1 may be useful in helping to group like-with-like measures, and indicates key terms used in the analysis below.

**Table 1: Policy Classification Framework**

Type	Sub-type	Examples
<b>Market regulation</b>	Performance based	Outcome based regulation, e.g., ‘less than 300 MJ/m <sup>2</sup> .a’
	Prescriptive	Input based

Type	Sub-type	Examples
		regulation, e.g. ‘insulation of at least R4’, planning requirements
	Information disclosure	CBD, mandatory labelling, EEO/NGER (mandatory audits/reporting)
	Hybrid	National Construction Code has elements of first two)
<b>Financial incentives</b>	Positive	VEET/white certificates, grants for building tune-ups, EUAs, CEFC, loan concessions, innovation tax concessions, producer subsidies
	Negative	Carbon or energy taxes, local govt levies, emissions trading
	Hybrid	Feebates
<b>Voluntary action/behaviour change programs</b>	Commitment programs, voluntary standards	e.g., CitySwitch, former Greenhouse Challenge, branding, voluntary reporting, branding, government procurement standards/policies for offices
	Engagement, information, tools and assistance, training, capacity building	NABERS, case studies, technical information
	Hybrid	Linked with another type, e.g., financial incentives

In the sections below, we consider in turn the key features of the policy options in use in Australia and around the world, include positive and negative aspects, and their relative efficiency in different domains. This project does not extend to quantification of the relative costs and benefits of each policy type, and this indeed would be difficult to do, as each example of each policy approach, in Australia and around the world, is in some way unique and bound to the particular circumstances that gave rise to it. In this chapter, we nevertheless try to abstract the inherent attributes of the different policy models.

## Mandatory Measures

Mandatory measures include building codes, minimum energy performance standards and labelling requirements, procurement requirements, white certificates schemes or energy efficiency obligations, but also taxes (including carbon taxes, levies), mandatory auditing, reporting and/or disclosure schemes. Mandatory denotes that, as a first round effect, some party in the economy is required to comply with the measure. The theory of action, thus far, is ‘thou shalt’.

However, the manner in which building codes and other mandatory measures actually work is more subtle and complex than might appear, and will depend upon the micro-design of the measure. We begin by considering what is globally the foundation policy for building energy efficiency and carbon performance: building codes.

### Building Codes

Building codes may be voluntary but for the most part of given effect via legislation and regulations. A common practice – seen in the United States, Europe and, effectively, Australia – is that a national or supranational body develops a ‘model’ building Code, which is then given legal effect in EU member states, or US/Australian states and territories, via state-based legislation and regulations.

A key design choice for Codes is the extent to which they are prescriptive (focused on inputs or processes) or performance-based (focused on outcome). In Australia’s case, our Code offers a choice between these two approaches. Typically the prescriptive (‘deemed-to-satisfy’ or DTS) path is chosen for smaller and simpler buildings, while performance-based solutions – which require some form of building modelling – are generally understood to be chosen for some 70% of Australian housing and the majority of commercial buildings, although statistics are not published in this area. To illustrate the distinction, a code can prescribe the minimum performance requirements for building elements, like u-values of glazing and R-values or thickness of insulation, or else can specify a performance outcome to be achieved, such as 6 star or a MJ/sqm.a target for commercial buildings.

Performance- or outcome-based measures are generally recognised as having the key benefit of stimulating innovation and competition, as market actors respond to the regulatory signal, test different solutions, learn by doing and, ultimately, develop effective and cost effective solutions.

However, this learning process imposes learning or transactions costs on parties, at least temporarily, as they must acquire information, perhaps new tools and materials, modify designs, analyse results and modify work practices. Prescriptive measures are criticised for failing to provide these innovation benefits, but it is not often recognised that they have the major benefits of providing certainty for all parties, therefore reducing information, search and learning (transactions) costs, maximising economies of scale, enabling market actors to focus on efficiency in delivery (rather than high-level design and innovation).

Also, codes have numerous and complex market impacts, including changing the relative demand for low- and high-carbon intensity products, services and solutions; second-round effects by stimulating innovation in building materials, technologies, designs and services; these innovation effects can drive both ‘technology performance learning’ – that is, technology development – and ‘technology cost learning’ – that is, lower unit costs through economies of scale, learning by doing, iterative product/service development. Also, while codes mandate some outcomes for building projects, the responses of product manufacturers, importers, product retailers and others are not mandated by codes. These parties can respond as they see fit, including by bringing forward or not bringing forward product research, development and commercialisation schedules (impacting on the availability and costs of products available to the building market); and investing or not investing in new production facilities for high-performance product. These second-round effects will significantly affect the impact and cost effectiveness of the regulatory signal. As discussed in Chapter 3, in other countries, these second- and nth-round effects are not only understood but actively targeted in policy design, including for mandatory measures like codes, but also in carefully-constructed policy packages which together are aimed at achieving ‘market transformation’. This is not the case in Australia.

Theme 1: <b>A Holistic Approach to Buildings:</b>	Theme 2: <b>A Dynamic Process</b>	Theme 3: <b>Proper Implementation</b>	Theme 4: <b>Technical Requirements</b>	Theme 5: <b>Overall Performance</b>
1. Performance based approach	4. Zero Energy Target	7. Good Enforcement	10. Building shell	13. Overall performance/on-site
2. Performance to include all energy types or uses?	5. Revision Cycles	8. Certification	11. Technical Systems	14. Overall performance/primary energy
3. Energy efficiency and renewable energy	6. Levels beyond minimum	9. Policy Packages	12. Renewable Energy Systems	15. Overall performance/GHG emissions

**Figure 1: Best Practice Themes and Criteria for Building Energy Performance Codes**

Source: GBPN (2014)



The degree of compliance with building codes is a matter that is of concern not only in Australia but also around the world. As the Global Building Performance Network notes: “Even the best building codes are worth very little if they are not implemented to a high standard and properly enforced”.<sup>55</sup> A recent report by the International Partnership for Energy Efficiency Co-operation (IPEEC) notes:<sup>56</sup>

*It is widely recognised amongst MEF and G20 government representatives that more robust building energy code implementation and compliance are critical to increasing energy savings.*

To achieve this, outcome:

*Effective implementation and compliance include a number of interconnected elements, including training and awareness programmes; building plan review and site inspections; supportive infrastructure such as software tools to check designs; meaningful penalties for non-compliance; and building material testing, rating, and labelling systems that allow for quick assessment of whether materials meet code-approved design requirements.*

The Global Buildings Performance Network (GBPN) has concluded that:<sup>57</sup>

*...today’s best practice/state of the art buildings must become the standard in less than ten years from now. For new buildings this means that all buildings should develop towards net zero energy or very low energy standards. For new buildings building mandatory energy efficiency codes are a central element in achieving these savings. Such codes need to be dynamic and ambitious and they need to be supported by a policy package with long-term targets of achieving zero or positive energy for all new construction. [emphasis added]*

While comparative stringency of building codes can be hard to assess, there are best practice elements which are notable. These include the use of a simple comparable metric (such as maximum energy demand per unit of floor space), airtightness requirements, pre-occupancy commissioning requirements, integrated targets (such as a national target to be energy-neutral), inclusion of onsite renewables in calculations, and ‘solar ready’ requirements.

The GBPN has developed a critical assessment methodology for building codes that identifies five themes, or performance dimensions, each with three performance criteria, to summarise best practices for building energy efficiency codes.

The methodology is based on a detailed desktop study of current literature in the field of building energy efficiency policy, as well as extensive peer review. Sixty-four building energy efficiency policy experts from academia, the private sector, national experts from different regions and international organisations, including the International Energy Agency (IEA), United Nations Environment Program (UNEP) and World Business Council for Sustainable Development (WBCSD) participated in the review of the assessment framework.<sup>58</sup>

A key quality attribute of building energy performance codes is their ambition or stringency. The International Energy Agency’s report, *Modernising Building Energy Codes*, notes:<sup>59</sup>

*The ultimate objective is to transform buildings from energy consumers to energy producers. Future updates to building energy codes will target nearly zero-energy consumption and will include all end-uses. This target can be achieved by moving to a comprehensive holistic approach in which: (a) energy demand is reduced by “energy sufficiency” measures; (b) energy consumption is reduced by using efficient building components and equipment to meet that energy demand; and (c) renewable resources are used to generate heat and electricity, thereby reducing buildings’ net energy demand. The combination of these three pillars – energy sufficiency, energy efficiency and supply from renewable energy sources – represents the modern approach to designing effective building energy codes.*

Another key element of building code administration is the frequency with which energy performance requirements are updated. The International Partnership for Energy Efficiency Co-operation (IPEEC)’s report *Delivering Energy Savings in Buildings* (2015) reviews the frequency of code revisions in a range of countries. It reports the following frequencies: Canada every 5 years; South Korea every 4 years; US every 3 years; and the EU member countries in line with EU Directives.<sup>60</sup> The International Energy Agency’s *Modernising Building Energy Codes* (2013) states that effective codes should be updated every 3 to 5 years (page 60).

The Global Buildings Performance Network (GBPN) uses the same figures for its international comparison analysis, noting a “maximum of 3-5 years” represents good practice.<sup>61</sup> Only NSW Basix is included in this analysis from Australia, and has claimed that it has a set revision cycle (although there is no

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<sup>55</sup> GBPN (2015), p. 10.

<sup>56</sup> OECD/IPEEC, *Delivering Energy Savings in Buildings: international collaboration on building energy code implementation*, 2015, p. 7.

<sup>57</sup> GBPN, *A Comparative Analysis of Building Energy Efficiency Policies for New Buildings*, February 2014, p. 6.

<sup>58</sup> Ibid. p. 10.

<sup>59</sup> IEA, *Modernising Building Energy Codes – to secure our global energy future*, 2013, p. 11.

<sup>60</sup> OECD/IPEEC, *Delivering Energy Savings in Buildings: international collaboration on building energy code implementation*, 2015, p. 36.

<sup>61</sup> Green Buildings Performance Network, *A Comparative Analysis of Building Energy Efficiency Policies for New Buildings*, February 2013, p. 25.

evidence of this in practice), and so it scored a 4 out of 10 for 'dynamic processes – revision cycle'. In the EU, member countries are required to evaluate changes to codes as per the cost-optimisation review and reporting process every 5 years. The Danish code is often cited as the most progressive in terms of setting future code updates. In the US, the requirement that the states review the provisions of their building codes regarding energy efficiency, and make a determination as to whether it is appropriate for them to revise their codes to meet or exceed the updated edition of the IECC/ASHRAE Standard 90.1 within 2 years. The model codes themselves are updated on a 3-yearly cycle.

#### Building product and equipment standards and labelling

Building equipment standards and labelling are mandatory measures given effect via regulation. The first-round and intended effect of labelling is to enable consumers (in this case, generally builders) to discriminate between high- and low- energy or carbon performance options. Its theory of action is that there are information market failures (e.g., a lack of market awareness of the relative performance and overall value proposition of different product choices) and that by providing this information – particularly in a timely way at the point of sale – then it is more likely that consumers will choose the higher performing products. However, builders do not pay the energy bills of the buildings that they build, and they have no inherent reason or incentive to select higher performing products (or designs). Note that different considerations apply for product labelling of consumer goods, where the purchaser does have an incentive to select more efficient options. Also, it should be noted that mandatory labelling is another phrase for mandatory disclosure which, in its broader context applying to whole buildings and leases, is discussed further below.

What therefore is the real impact of such labelling (as a stand-alone intervention)? Labelling makes visible to the market a previously invisible, or poorly visible, attribute – and that is the energy (or carbon- or resource-) efficiency. This creates the potential for product and market discrimination based on this attribute – including competition between suppliers to create higher labelled product and the prospect of price premiums for higher-labelled product (noting that, on the one hand, the higher energy performance justifies the consumer paying a higher price, and that this higher price acts as a reward for innovation for producers that can bring higher-performing product to market; but at the same time, the measure stimulates competition between suppliers in that higher-performance niche, and this will tend to drive premiums down and product quality up over time). When these effects are sustained/increased over time – which requires comparative labelling (like star ratings) and not static endorsement labelling (examples include Energy Star in the US) – then labelling can contribute important market transformation outcomes. Product innovations of the kind described are rarely reversed – because manufacturers and suppliers 're-tool' to provide the higher-performing product, and less (or none) of the lower-performing ones, while consumers also learn and form new preferences – and may

also realise higher margins on these higher performing elements.

In reality, however, product labelling is rarely conceived of as a stand-alone policy intervention. In conjunction with minimum energy performance standards (MEPS) – see below – labelling can assist to create demand and at least temporary premiums for higher-performing product, sufficient to incentivise the development, or at least stocking and supply, of new and higher-performing product. In effect, labelling draws attention to and rewards the energy performance attribute of a product. Particularly for complex products (like whole buildings), or for building products that have an indirect (and contingent) effect on energy savings (like glazing, as distinct from chillers or lamps, where are direct and relatively easy to measure), labelling simplifies the process of selecting higher-performing product – obviating the need for consumers (in this case, intermediaries such as builders, designers and quantity surveyors) to undertake extensive and expensive research in order to identify and select higher value products.

Labelling will be more effective again in the presence of 'demand pull' policies – measures that stimulate the demand for more energy/carbon efficient solutions. These might include voluntary or mandatory ratings/disclosure schemes, like NABERS or Commercial Building Disclosure, but also codes with higher energy/carbon performance requirements, certification schemes like Green Star, and many others. In these cases, labelling can assist with meeting the enhanced demand for building efficiency, by reducing search costs for market actors.

Minimum energy performance standards (MEPS) for building equipment and elements – like chillers, lamps, glazing – are mandatory and a regulatory instrument. Legally they ban the sale of non-compliant equipment, and therefore they directly on retailers/suppliers. The first-round or static effect is to eliminate the lowest-performing products from the market. Since a benefit cost analysis and regulation impact assessment is required ahead of such regulation, we can be confident that those products banned from sale impose net costs on society, while the regulatory intervention creates net benefits by eliminating them. These benefits include direct energy cost savings for consumers, but also reduced impacts such as climate change.

However, the first-round effect represents only a small part of the impact and theory of change behind MEPS. Eliminating poorly-performing product creates head-room in the market for new entrants – which can include new companies/suppliers, new and innovative technologies and new designs. MEPS – again, particularly when sustained and progressively ramped up through time – can create a 'technology push' effect, which is strongly complemented by 'demand pull' measures including labelling and the others noted. The process is all about stimulating innovation – but not any kind of innovation; rather it focuses innovation specifically on energy/carbon performance. The focus of MEPS is not consumers, but primarily producers and suppliers, and secondarily market intermediaries (resellers, retailers, service/maintenance companies – all of whom must

agree to stock and support the higher-performing product range.

Critically, innovation – both by suppliers and the market intermediaries – involves risks and uncertainty of rewards. Particularly as building product and technology markets – like others – globalise, Australia’s relatively small market means that there are greater risks, and smaller prospects of return, for local manufacturers when seeking to innovate around high energy/carbon performance. This risk is exacerbated if the policy environment fails to require or reward high standards, and is significantly reduced if the policy environment does offer such rewards. Regulatory policies – and even prescriptive regulations, as noted above – create the greatest certainty for product suppliers. Incentive based measures that are not prescriptive of outcomes – such as the Emissions Reduction Fund, for example, or performance-based regulatory measures such as performance-based Codes, also stimulate demand but for a class of products. In both cases, competition is a key factor that will influence the success of the regulatory measure in stimulating innovation. There is a risk that if a particular market is weakly competitive, and high or prescriptive policies are set, then individual suppliers could extract monopoly or oligopoly rents. However, in an era of low or non-existent tariff barriers and globalised technology/product and information markets, and with a preponderance towards performance-based and non-prescriptive policy settings, such risks are low. To the extent that they do arise, they are likely to stimulate competitive responses to both drive (carbon) innovation and drive down prices, to benefit of consumers and the environment alike.

#### Procurement Requirements

Around the world, procurement is a recognised as a key policy lever, and widely used as the core of market transformation initiatives (see Section 3.4.1 below). Procurement initiatives – to procure energy efficient buildings or tenancies, for example, above Code minimum standards – are generally taken by governments. In Australia, the Australian Government and many states and territories require their agencies to seek 4.5 or 5 star (NABERS) office tenancies, at least for new tenancies. It is possible for companies – including major corporates with Corporate Social Responsibility charters – to do likewise. Procurement can also be considered an example of ‘public leadership’, as discussed in Section 3.3.4 below, although this might be best expressed as ‘leadership in the public interest’, as such leadership is not confined to or necessarily led by governments.

Procurement policies have no mandatory impact on other parties, such as suppliers; their participation is entirely optional. However, the measures create additional demand for higher-performance buildings and tenancies. Industry stakeholders invariably express strong support for such procurement requirements, and they are perceived as customer-driven and incentive-based (the supply and competitiveness of the relevant market segments will determine the extent to which building owners are able to

achieve premiums for such offices, which in turn will drive the cost of the measure to government).

Our inquiries suggest that there have not yet been formal and independent *ex poste* evaluations undertaken to document the actual performance of such measures in the Australian office market. However, there appears to be a strong consensus amongst analysts, government officials and the office sector that they are, for the most part, highly effective – with the primary reservation being the extent to which the policies are in fact implemented and complied with by agencies. This appears to be a particular concern in NSW, and this aspect is likely to be considered in the context of a review of that State’s procurement policies, which is currently underway.

Setting compliance aside, Adelaide is identified as an example of a city where office procurement policies have been particularly effective. In consulting with agencies and industry stakeholders during the Carbon Neutral Adelaide project, our team was told that every new office building built in the central business district and wider Greater Adelaide Area, following the introduction of South Australia’s 5-star procurement policy, has been 5 star (at least a star above the Code minimum). In addition, it was claimed that the majority of office retrofits of older buildings have specified achieving 5 star post-upgrade – as around 40% of all office space in the CBD is occupied by government and quasi-government agencies. Assuming these claims are correct, this would amount to a very significant lift in the average energy efficiency of office buildings in that city – perhaps equivalent to an uplift in the National Construction Code.

The linkage between procurement policies and innovation/risk in the building supply chain is particularly important. For equipment manufacturer and suppliers, the primary commercial risk associated with innovation for higher energy and carbon performance is that the costs of research, development and commercialisation – or even local stocking, homologation/standards compliance, national distributor/warranty support and industry awareness-raising/education costs for importers – may not be justified by the extent of eventual market demand. This is particularly the case where standards (e.g., the building code) are unchallenging and static over time, as has been the case in Australia since at least 2010. Procurement policies – particularly if they are diligently implemented or based on achieving quantitative targets (see Market Transformation below) – can remove a significant portion of this commercial risk. As noted above, they do not – and should not – remove all commercial risk, as competition between suppliers is critical to ensure cost-effective outcomes.

This consideration also suggests that procurement policies should generally not be set at performance levels above those that are able to be met by a reasonable number of independent suppliers. That said, this approach is often deliberately breached as part of a carefully-designed market transformation initiative.

The dynamic and policy-package effects of procurement policies should also be considered. By supporting the development of a high-performance market, they enable

greater volumes of such equipment (or buildings) to come to market. This creates greater competition on the supply side of the market, helping to drive down the incremental costs of higher performance over time, while also growing market familiarity with the product and helping with its adaptation into new and cost-effective overall building systems ('technology cost learning'). This in turn encourages manufacturers and suppliers to continue to innovate and bring new and still higher performance/lower cost variants to market. Over time, and as noted in the Adelaide office market, the whole 'centre of gravity' of a market can shift from low- to high-energy performance, achieving a 'market transformation' outcome. To the extent that this occurs, the cost benefit analysis for regulatory measures is fundamentally improved, as the cost of achieving higher performance has been driven down. As a result, higher minimum energy performance standards in the National Construction Code would be economically justified than would otherwise have been the case.

In this way, and even though procurement is voluntary for suppliers and likely to appeal initially and directly to those targeting the upper end of the performance spectrum, the market transformation effect can translate – via higher standards – into improved outcomes for the whole building stock.

Noting the potential of this approach, and the informal assessment of its effectiveness and cost-effectiveness, it would be highly valuable for those governments pursuing such policies to undertake formal evaluations and to publish the results. Also, with the understanding that many jurisdictions are currently reviewing such policies and considering new performance requirements, we would strongly encourage those jurisdictions to understand of the importance and systemic benefits of setting high rather than low standards.

#### White certificate and retailer obligations schemes

Internationally, and even nationally, this is a large class of policies, beyond the scope of this project to fully document. These measures are routinely described as 'economic' or 'market-based', but interestingly the one factor common to them all is regulation: all involve mandatory targets being set (typically for energy savings relative to an historical baseline) via legislation, while the allowed avenues for demonstrating compliance with these schemes are generally set out in supporting regulations. This, in common with carbon pricing schemes that share many similar features with white certificate schemes in particular, is perhaps the clearest demonstration of the key role that regulation can play in creating efficient markets where none existed before. Their second role, as discussed further below, is to determine the quality of market outcomes, at least in particular domains, such as energy or carbon efficiency.

Efficiency or demand-side-management (DSM) obligations that are imposed *without* the use of tradeable certificates as a unit of market currency are generally denoted 'retailer obligation schemes' (ROS), while those with tradeable

certificates are generally denoted 'white certificate' schemes (to distinguish them from carbon trading – 'black certificates' – and renewable energy trading – 'green certificates'). In Australia, and as discussed in Chapter 5 below, South Australia, Victoria, the ACT and New South Wales have such schemes in place. The key recommendations of the 2010 *Prime Minister's Task Force on Energy Efficiency – Recommendations 1 and 2* – that a national energy savings target and scheme (a 'national energy savings initiative') be implemented were rejected by the government of the day, and no such scheme has since been implemented.<sup>62</sup>

Generally, the party directly required to comply with these schemes is an energy retailer (typically electricity but sometimes also gas retailers, but also network businesses – in many countries these are not vertically separated, although they are in Australia). However, recalling the distinction made above between how measures are *given* effect and how they *take* effect, retailer obligation schemes (another generic term for the class of measures) are given effect by placing obligations on retailers, but take effect quite differently. In effect the regulated party becomes a 'market maker'. That is, the regulation essentially requires the regulated party to achieve an outcome (an energy saving), but does not prescribe how that saving is to be achieved. Regulations do generally specify processes for documenting allowed savings, essentially to ensure that those savings are genuine and additional, but retailers have considerable freedom as to how they achieve the required outcome. While some schemes allow and encourage retailers to find savings within their own operations, or upstream in energy networks or even flowing through to generators (with key examples including reduction in line losses, and power factor correction), for the most part, the key role of retailers is to create a market in energy savings that previously did not exist.

For ROSs without trading, the retailer may hold competitive tenders for the supply of energy savings services, or initiative home energy audit or other programs, delivered by external service providers – energy savings companies, or ESCOs. Schemes with tradeable certificates encourage even wider participation by a wide range of (accredited) service providers, who seek out least cost savings opportunities, document these in a manner that enables certificates to be issued, and then those certificates are sold back to the energy retailer, or are supplied to the retailer under contract, or are sold on secondary markets. The final step is cost pass-through. That is, the costs incurred by the retailer in managing these schemes are generally recovered either via a levy on sales or simply as an allowable cost loading. In Australia's National Energy Law, there is a provision that recognises 'jurisdictional schemes' and allows network

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<sup>62</sup> Australian Government, Report of the Prime Minister's Task Group on Energy Efficiency, Canberra, July 1010, p. 5.



businesses to recover reasonable costs through network charges.<sup>63</sup>

The effectiveness of ROSs depends first on the size of the energy savings target set; second, the degree to which savings are genuine and additional; and third, the degree to which they stimulate the growth of a viable and self-reliant ESCO sector in the longer term. Australia's early experience with these schemes was characterised by small targets (typically starting at 1% of a network's businesses load) and plagued by 'light bulb changers' – parties, including very often labour hire firms, that recruited non-expert personnel to go door-to-door and install, or simply hand over, compact fluorescent lamps, low-flow showerheads and, later, standby power controllers, in order to generate certificates. However, at around the same time, the Australian Government was phasing out incandescent lamps – the only known example of the government pursuing a market transformation policy – and therefore the additionality of CFL give-aways was very limited. At best, some savings were brought forward in time. There were also stories of the CFLs appearing in second-hand markets shortly afterwards. Standby power controllers – which are still eligible for savings under many schemes, are another device favoured by suppliers for their low costs and (relative) ease of installation. However, if these devices are not appropriately installed – for example to control the standby power consumption of the whole of an entertainment unit – they may save little or no power. Stories suggested that many consumers, simply handed these devices, had no idea what they were for and put them in the rubbish bin. Consumers generally equate the price of a good with its value. If its price is zero, its value may be perceived as zero.

Such stories may be apocryphal, but reflect a key design issue for this policy model – they require quality assurance. This may take the form of mandatory training and accreditation of service providers, random audits, spot checks to ascertain that devices are correctly installed and operating, follow-up surveys with householders and others. These obligations could be placed on the regulated party by the scheme regulator. Further, the scheme administrators need to ensure that allowed actions can reliably create genuine and additional savings, for example by excluded from their schemes actions that would be expected to occur in the normal course of events. Arguably the schemes should focus on larger energy efficiency investments with lower paybacks (e.g., in insulation retrofits, high-performance air conditioners, appliances and hot water systems) that require co-investment from the householder or business, and which are less likely to occur in the absence of the scheme at its

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<sup>63</sup> Jurisdictional schemes are programs implemented by State governments that place legislative obligations on distribution networks. Jurisdictional schemes include the schemes set out explicitly under clause 6.18.7A(e) of the National Electricity Rules (NER), as well as those determined by the Australian Energy Regulator (AER) to be jurisdictional schemes under clause 6.18.7A(l).

financial support. Only the South Australian scheme currently supports top-up insulation, no doubt as an over-reaction to criticism of the Australian Government's Home Insulation Program, yet Energy Efficient Strategies estimated there are around 1.3 million homes in Australia still without ceiling insulation, 2.1 million with inadequate ceiling insulation, and 3 million without external wall insulation.<sup>64</sup> Where co-investment is required, the householder or business is much more likely to value the investment, largely eliminating the risk of equipment ending up in secondary markets.

As a side note, there is a risk that governments will seek popular or headline-grabbing outcomes from such schemes – for example, the highest number of devices supplied, or the highest claimed savings at the lowest claimed cost – yet the easiest way to achieve such outcomes is, in effect, to cheat. Schemes with low additionality claiming low unit savings costs only serve to debase the policy model. More sophisticated performance metrics and targets for such schemes may help to eliminate this form of goal displacement.

As the size of targets under some schemes has grown – notably the Energy Saver Scheme in NSW – and following a decision to widen the scope of this and some other schemes beyond households to commercial lighting upgrades and other, larger projects, the scale, cost effectiveness and additionality of savings achieved under these schemes has improved. The addition of 'project-based' savings options has had the secondary benefit of requiring, and growing, ESCOs with deeper and more diverse skills, and eliminating the give-away model. Such businesses are more likely to offer commercially-valuable services and thrive even such schemes are eventually phased out.

Since such schemes are, in effect, designed to overcome information market failures – whereby consumers and some businesses fail to acquire information and understand the (private and social) value of energy savings options, it seems clear that consumer education must be a clear goal. Under the Australian Government's now defunct Low Income Energy Efficiency Program, service providers spent an hour, on average, with householders, helping them to understand how and where energy cost is being incurred in the house and identifying strategies that accorded with the householder's preferences and budget.

Another lesson that can be drawn from Australia's experience with these schemes is that, for the most part, they have not been carefully targeted to households (or businesses) most in need as assistance, although South Australia's Retailer Energy Efficiency Scheme (REES) requires that at least one quarter of the savings are achieved from low income households. The Australian Council of Social Service (ACOSS) notes that:

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<sup>64</sup> Energy Efficient Strategies, *The Value of Insulation Based Residential Energy Savings Measures in Australia*, report prepared for ICANZ, September, 2012, p. 7.

People on low incomes are more likely to own old and inefficient refrigerators (ABS 2009a), use cheap and inefficient heaters (ABS 2009b), and are more likely to use electric hot water heaters which are more expensive to run than gas or solar systems (DHS 2008). Aggregate data provided by the NSW Home Power Savings Program showed that 77% of low income homes visited by the Program had gaps in doors and windows (HPSP 2013). Low income tenants are twice as likely to be living in an un-insulated home, when compared to owner occupied homes (ABS 2009a).<sup>65</sup>

It recommends energy efficiency standards for rental properties and tax incentives for landlords undertaking energy efficiency upgrades, along with additional funding for targeted retrofits of the worst-performing social housing.

This latter recommendation highlights a second potential targeting basis for retailer energy efficiency schemes – establishments with high energy intensity. Such establishments are a potential target for ESCOs as, in principle, they are likely to offer greater energy savings opportunities. However, with Australia having no energy efficiency disclosure requirements outside commercial offices (and houses in the ACT), and energy retailers regarding household and business consumption data as confidential, the information required for targeting of both ESCO service provision and ROS is missing. Mandatory disclosure – discussed below – may go some way to addressing this concern, but such schemes are unlikely to extend to the general business sector. A change in the law to require discoverability of energy consumption data – at least for policy and research purposes, if not direct service provision – is likely to be required.

Overall, ROSs have the potential to be an important element of the overall policy landscape, provided targets are meaningful (and ramped up over time), quality assurance is a high priority, and schemes are well-targeted.

#### Fiscal instruments

Mandatory fiscal instruments are essentially taxes and charges including levies. Taxes to limit pollution and other negative externalities were first proposed by Arthur Pigou in 1920, and are known as ‘Pigouvean’ taxes.<sup>66</sup> Carbon taxes are a key example. The core idea is that where activities are generating negative externalities, a tax is imposed equal to the marginal social cost created by those externalities. The tax would both discourage the activity and, to the extent that the activity continues, generate revenue to remedy the impacts or compensate those adversely affected. Subsidies for activities that generate positive externalities are a counterpart idea, while ‘feebates’ combine the two approaches – applying fees for negative externalities and recycling that revenue to provide rebates for positive ones. Feebates emerged in the United States and are best known in the area of motor vehicle registration – high emissions/fuel consuming vehicles are charged higher registration fees, and low emissions/fuel consuming vehicles lower fees, with the net impact targeting revenue neutrality; that is, no net cost to government. Rather they act as a consumer transfer from those creating negative externalities to those creating positive ones.

In the built environment, mandatory taxes relating energy or carbon performance are virtually unknown in Australia. Some local government areas, such as Adelaide City Council and the former Leichhardt City Council impose environmental levies on ratepayers, with the revenue recycled into environmental works including energy and carbon saving projects. At a national scale, carbon taxes would be an example of a mandatory fiscal instrument, and the early operation of the former Carbon Pollution Reduction Scheme effectively amounted to a carbon tax scheme (as mooted quantitative emissions limits never took effect). Without a detailed study, we can say that there is at least *prima facie* evidence that this tax was effective in reducing greenhouse gas emissions in Australia, at least from the electricity generation sector (the largest emissions source in Australia). The figure below shows, in the grey line, the decline in energy-related emissions that occurred between 1 July 2012 and 1 July 2014, the period during which the effective tax applied. Since it was removed, and starting precisely from July 2014, emissions have risen consistently.

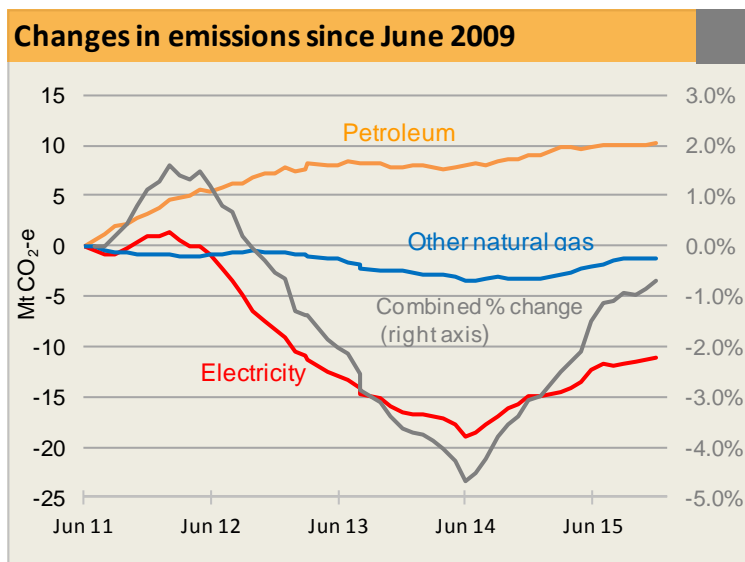


Figure 2: Changes in Energy-Related Emissions since June 2009

<sup>65</sup> ACOSS, Energy Efficiency and People on Low Incomes: improving affordability, September 2013, p. 2.

<sup>66</sup> Pigou, A. C. (1920). *The Economics of Welfare*. London: Macmillan.

Source: *pitt&sherry, Carbon Emissions Index (CEDEX), March 2016*

While such reductions in upstream emissions do effectively reduce emissions attributable to activity in the built environment, this is an indirect effect of a carbon tax for that sector. The direct effect is the apparent change in price of energy to building occupants. As discussed in Chapter 2, this signal is much more attenuated – firstly by the relatively modest weighting of wholesale energy prices in the final price paid by consumers, but secondly by leasing arrangements which, in the case of a gross lease (where the landlord pays utility bills), may not flow through to the building owner until lease rates are indexed or renegotiated (some lease clauses have cost pass-through clauses, so it is difficult to generalise). Overall, we noted that many barriers to energy efficiency in the built environment are non-price in nature; therefore changing relative prices via Pigouvean taxes will, in principle, have less impact on outcomes in this sector than in others. However, national scale carbon taxes also generate significant revenue which, as noted, can be recycled, including into energy saving initiatives and investments – such as the former Green Building Fund, or Low Income Energy Efficiency Program. In the built environment, it is likely to be these kinds of initiatives, together with the indirect effect on the greenhouse gas emissions intensity of electricity supply, that are the major drivers of change associated with carbon taxation.

Environmental levies are more likely to be applied at state and local level, and can be structured to act as a Pigouvean tax, at least where the levy is proportional to energy or carbon outcomes. However, as noted, they can also simply be hypothecated revenue-raising devices, where the primary environment benefit is derived from the expenditure of the funds raised. Other models are possible – for example where levies are made contingent, either on information disclosure (to overcome the chronic lack of energy efficiency data noted in the previous section), achievement of a particular performance benchmark, or a rate of improvement through time. In this case, levies shade into, or become a key element of, other policy models discussed below, such as disclosure schemes.

Note that tax expenditures and other fiscal instruments, such as subsidies, are covered under Section 3.3.1 below.

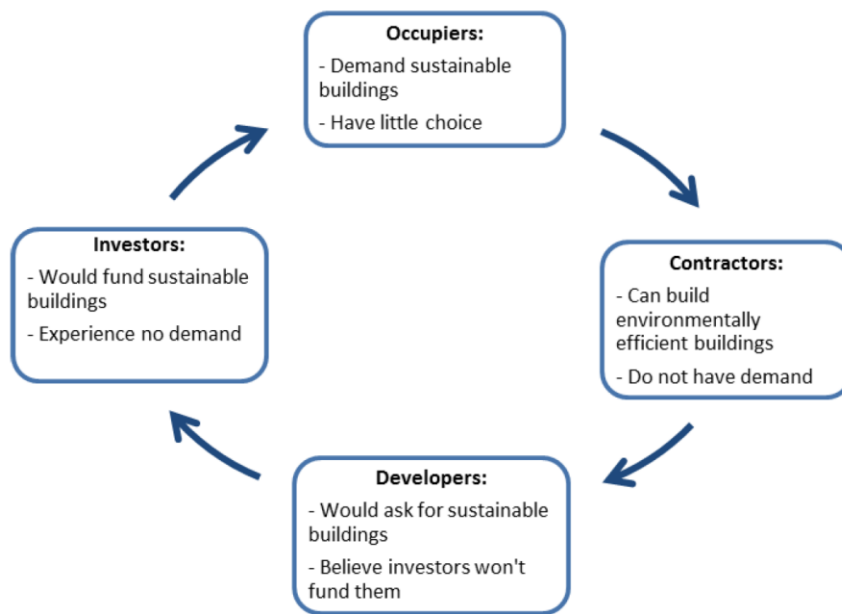
#### Mandatory Disclosure

Mandatory disclosure of energy efficiency information is a relatively new policy type – albeit that it has been a cornerstone of the European Union’s Energy Performance of Buildings Directive (EPBD) since January 2003. In Australia, mandatory disclosure was nominated as a priority in the 2004 Energy White Paper, *Securing Australia’s Energy Future*, which noted:

*To complement the existing performance ratings for commercial and residential buildings, the government will work with the states and territories to require landlords and building owners to disclose energy performance information in leases and sales agreements.*

It is worth noting that the scope of buildings covered by this commitment was not limited to any particular type. In Australia, mandatory disclosure took effect for larger offices only (greater than 2,000 sqm), nearly eight years later, in November 2011.

The policy model and theory of action for mandatory disclosure is straightforward. Since as discussed in Chapter 2, the energy efficiency of buildings is not apparent or transparent, this presents an inherent information market failure. Further, information asymmetries are expected to lead to adverse selection of low-efficiency buildings. By requiring building owners to disclose the actual performance of their buildings, at least upon sale or lease – although other countries including all of Europe require continuous disclosure – two critical consequences can arise. First, potential purchasers or lessees of the building (or of a space within the building) are informed of the relative energy costs associated with the various buildings or leases on the market at that time, and are therefore enabled to make a rational and optimal decision.



**Figure 3: Why Are Buildings Not More Sustainable? The Vicious Circle of Blame**

Source: European Commission, DG Energy (2013), p. 27.

Second, and in many ways more importantly, the second-round effect of mandatory disclosure is to create competitive pressure between building owners and landlord on the energy efficiency performance of their building – an attribute which was previously invisible, if not actively concealed. In a competitive market, those owners with less efficient buildings are likely to find them more difficult to sell or lease, and are likely to need to offer price discounts. These discounts, in effect, compensate the new building owners or lessees for the higher operational expenses they will experience. Conversely, owners of higher-performing buildings are more likely to find them easy to lease or sell and may be able to derive market premiums. Such premiums enable owners to achieve a return on investment in energy efficiency upgrades – overcoming the ‘tenant/landlord split’ that represents a critical market failure in the built environment (Chapter 2), while the premiums are worth paying by the new owners or tenants as they will experience lower operational costs.

In economic theory, perfect or complete information is a fundamental attribute of well-functioning markets. This explains why, as discussed further in Chapter 5, the 2007 Garnaut Climate Change Review noted that:

*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. [emphasis added]*<sup>67</sup>

In 2013, the European Commission (DG Energy) released a study entitled *Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries*.<sup>68</sup> As the title indicates, this work primarily examines whether disclosure is

associated with higher prices and rents, and indeed concludes that this is so: a one-letter improvement (on the A – G European rating scale) is associated with up to 12% higher property values, although values between 2% and 6% are more common.<sup>69</sup> This is an important result, because it supports the theory of action underpinning this measure, as noted above.

This study also supports the rationale for mandatory disclosure, noting that a ‘vicious circle of blame’ has been observed when studies are undertaken as to why building energy efficiency has not improved at a faster rate. Because, as described in Chapter 2, buildings are complex systems, with multiple actors involved in their development, no one party is able (or willing) to accept accountability for sustainability performance: each party blames the others.

However, the study notes (p. 28):

*...the vicious circle can be broken by providing actors with appropriate feedback on both the environmental and social aspects of building performance as well as on its various interrelations with financial performance and property value.*

Citing Lorenz and Lutzkendorf,<sup>70</sup> the study argues (*ibid*) that mandatory disclosure can lead to:

<sup>67</sup> R. Garnaut, *Garnaut Climate Change Review*, 2007, p. 412.

<sup>68</sup> European Commission (DG Energy), *Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries*, April 2013.

<sup>69</sup> *Ibid*, p. 117.

<sup>70</sup> Lorenz, D. and T. Lutzkendorf (2008a) *Next generation decision support instruments for the property industry – understand the financial implications of sustainable building*



*...a radical change in how we understand and value our built environment and that the end result will be the emergence of a proactive, self-perpetuating loop driving further change and even more sustainable behaviour – in other words a virtuous circle instead of a vicious circle.*

Implicit in the theory of action for this policy model is the idea of competition – enabled by information. This has led many to assume that this model can only apply to building markets which have competitive features such as high turnover. This partly explains, for example, why Australia's CBD scheme is limited to commercial offices – this is seen as a competitive market segment with high turnover of tenancies and even whole buildings (which are traded between property trusts and institutions). However, we would offer an additional insight, which is that the sale or lease of a building acts as a trigger for disclosure and, potentially, building upgrade. While that trigger is largely missing from some other building segments – including institutional buildings such as universities, schools, hospitals, museums, galleries, libraries and many others. Many of these buildings are owner-occupied and therefore do not suffer from the tenant/landlord split incentive. As a result, economic theory suggests these should be more energy efficient than other (similar) buildings, yet as noted in Chapter 5, the little evidence that has been examined in this area in Australia (for offices) suggests otherwise.

We offer the perspective that what the institutional buildings lack is a trigger that focuses owners and managers on the question of energy performance. In principle, an unexpectedly large energy bill could become a trigger event. However, persons delegated the function of paying utility bills tend to be at the lower end of organisational hierarchies. Unless there are strong systems of cost control in place – and noting the trend towards electronic billing and payment systems – cost movements may not be recognised, or may be attributed to other causes (weather or occupancy/use patterns). Also, reflecting the information market failures discussed in Chapter 2, most building owners and managers do not possess the specialised knowledge and relevant information to assess whether or not there is a cost-effective opportunity to improve building efficiency. As a result – and given the absence of external triggers – the work required to establish the potentially attractive business case for upgrade is neither demanded nor supplied – as it would have to be understood in advance in order to justify the expense of documenting that business case. Absent a trigger, the vicious circle continues. With a trigger – continuous/annual disclosure of building energy performance – managers and their Boards will be equipped with the information required to make rational decisions about energy efficiency upgrades. Of course, mandatory disclosure does not mandate building upgrades – it only overcomes the information market failures that prevent rational decisions being made. As discussed in Chapter 5, there is strong evidence that Australia's CBD

program has been highly effective already, even if, as discussed later, it is strictly and unreasonably limited in scope.

Relatedly, it is interesting to observe how the large commercial office market in Australia has responded to the introduction of mandatory disclosure. While the CBD scheme (described in Chapter 5) does not require it, property trusts and institutional owners rapidly adopted internal policies that required all buildings to be continuously rated. The rationale for this included:

- Buildings must be ready for sale or lease at any time, and there are potentially losses associated with the time-lag required between buyer/lessee interest and being able to disclose energy performance if a building is not already rated
- Continuous disclosure enables the energy performance of buildings and portfolios to be tracked, helping to close the business case on performance upgrades, by establishing the capital/yield premiums expected to be earned by the building portfolio as a function of its higher performance
- The higher 'book value' and expected yield of the portfolio enables greater borrowings and investments by the commercial owner, dramatically enhancing the overall return on investment in building upgrades, and dwarfing the cost of achieving continuous disclosure.

This once again illustrates how regulations – for mandatory disclosure is a regulatory measure – can make markets, and make them work better. By overcoming what is called an information market failure, but which, as noted, is simply an inherent attribute of the built environment, regulation can create value for multiple parties, including for values not directly represented in market-based transactions, such as environmental ones. From our perspective, it is moot whether a failure to regulate to overcome an inherent market attribute is best described as a market or as a government failure.

Overall, we note that mandatory disclosure is an efficient, market-making measure that is already proven to be effective and cost-effective. In Australia, the key limitation is that it is applied to only a very small fraction of the total building stock. Expanding the scope of mandatory disclosure to *all* buildings, and not just to large commercial offices, would dramatically increase the economic and environmental benefits generated by the policy and regulatory framework for our built environment.

#### Mandatory Auditing and Reporting

The UNEP Report *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings* described mandatory auditing as "...one of the most common policy

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in *Proceedings at the World Sustainable Building Conference*, Melbourne, Australia, 21-25 September 2008.

instruments in many European and other countries”.<sup>71</sup> It reports that such schemes are most common for industrial and large commercial users and rare for residential buildings. Recalling comments made above for white certificates schemes, the report also notes that “...mandatory audit programs require qualified auditors and energy

managers which necessitates a certification process.”<sup>72</sup> In common with voluntary rating, certification and labelling schemes reviewed below (Section 3.3.3), mandatory audits (and reporting) require agreed and high-quality auditing or ratings tools and processes, in addition to effective quality assurance.

The UNEP report notes that mandatory audits are more effective when linked to schemes that ensure access to finance, in order that the investments recommended by the audits are in fact able to be carried out, and also that the audits themselves are often partially or fully funded by government. For example it notes that:<sup>73</sup>

*...if the audit is subsidized, but not the implementation of the suggested improvements, the rate of implementation is frequently low, for instance below 20% in Lebanon. This rate is much higher, i.e. around 60-70% in Tunisia, where a fund is available to support part of the energy efficiency improvements.*

It also underscores the importance of high quality program implementation and quality assurance:<sup>74</sup>

*...subsidized or mandatory audits require capacity-building of consultants who perform the audits. Lack of monitoring of the audit's quality as well as its follow-up is a major reason for the limited success of this measure in Egypt [...] Often, the information from audits is collected in a central government body, but follow-up is difficult due to understaffing at the agency. Capacity-building of all involved actors, including officials, is therefore a prerequisite for the success of this measure.*

At the same time, this source and others agree that this mechanism can be effectively and highly cost-effective. It notes that the US weatherisation program (audits and retrofits delivered as a demand side management or DSM programs) results in around 100,000 homes being upgraded annually, resulting in average fuel consumptions savings of 21%.<sup>75</sup>

In Australia, a voluntary audit program was delivered in the 1990s – the *National Energy Efficiency Audit Program* – and the *Energy Efficiency Opportunities* (EEO) Program, which ran very successfully from 2006 – 2014, was a mandatory audit and reporting program for large commercial and industrial

energy users. The program, which the Australian Government’s Energy Efficiency Exchange website notes was closed ‘...in line with the [then] government’s commitment to reduce costs for business and its deregulation agenda’, was attributed already by 2011 with having:<sup>76</sup>

- *Identified opportunities amounted to energy savings of 164.2 PJ, which was equivalent to 2.7% of Australian annual energy use or approximately 3.3 million Australian households and their cars.*
- *These identified opportunities with payback periods of four years or less were expected to lead to annual net financial benefits of \$1243 million.*
- *Adopted project savings amounted to 88.8 PJ (54% of the energy savings identified) or annual net financial benefits of \$808 million.*
- *Identified opportunities equated to a potential greenhouse gas emissions reduction of 14.5 MtCO<sub>2</sub>e or 2.6% of total Australian greenhouse gas emissions in the 12 months to December 2011.*
- *Adopted project savings equated to an estimated emissions reduction of 8.2 MtCO<sub>2</sub>e which was equivalent to 1.5% of total Australian greenhouse gas emissions or approximately 2.3 million cars off the road.*

In the built environment, mandatory auditing and reporting programs are apparent in major cities and city states, including New York, Singapore, Hong Kong, as described in Chapter 4, and are also reported in UNEP (2007) in Thailand and Korea.

While a step short of mandatory disclosure, and therefore lacking the competitive pressure theory of action described above for that measure, mandatory auditing and reporting schemes seek not only to overcome information market failures – a lack of knowledge about energy and carbon savings opportunities and their opportunity costs – but also to overcome organisational barriers. The mandatory and reporting aspects bring Board-level considerations to bear – not only compliance but also reputational risk. This achieves the trigger effect noted above; however, absent competitive pressure or, as noted above, other forms of support, this approach may not be as effective as mandatory disclosure. On the other hand, it should be recalled that programs like EEO went to great lengths to educate and train companies on the fundamentals of energy auditing, including best practices in internal reporting and decision-making. This capacity-building aspect may be the most important long-term legacy of the EEO program and could in principle be for new programs with similar regulatory drivers.

Carbon Trading Schemes

<sup>71</sup> UNEP and Central European University, *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings*, 2007, p. 24.

<sup>72</sup> Ibid.

<sup>73</sup> Ibid.

<sup>74</sup> Ibid.

<sup>75</sup> Ibid.

<sup>76</sup> <https://www.eex.gov.au/large-energy-users/energy-management/energy-efficiency-opportunities>, viewed 29 January 2017.

For similar reasons as noted above for carbon taxes, economy-wide carbon emission permit schemes – as critical as they are at a national level for overall emissions control – will have a key but largely indirect effect in the built environment. The direct price signal will not be strongly felt by participants in building markets, due to the prevalence of *non-price* market and regulatory failures. However, carbon pricing has already been shown in Australia to be highly effective in driving lower emissions in the electricity sector, which translates to lower carbon emissions induced by economic activity in the built environment.

There are, however, examples of emissions trading schemes that specifically target buildings. The City of Tokyo maintains a cap and trade scheme which it claims was the first such mandatory scheme in the world to cover commercial buildings.<sup>77</sup> In its initial period of 2010 – 2014, it required 8% emission reductions for offices and 6% for industrial facilities over the initial 2010 – 2014 period. Facility owners may trade emissions reduction permits with others covered by the scheme. During the second period from 2015 to 2019, the reduction obligations increase to 17% for businesses and 15% for industrial facilities. A recent report noted that over 90% of targeted facilities surpassed their reduction targets for the first compliance period and that:<sup>78</sup>

*In FY2014, the last year of the first compliance period, the Tokyo Cap-and-Trade Program achieved a 25% reduction compared to the base emissions, which is the largest reduction rate in the past 5 years... The total reduction amount for 5 years runs to 14 million tonnes.*

While this appears to have been a successful initiative – triggered as it was by the power crises that Japan and Tokyo have experienced in recent years – its city-wide scale makes it more akin to a white certificates scheme, albeit using a carbon metric. A city-scale program of this type would only be feasible where there were a large enough pool of covered facilities; i.e., in a large city. That is because the key theoretical advantage of cap-and-trade schemes over carbon taxes arises where the regulated parties face differing marginal costs and opportunities for abatement. In such a case, some parties will be willing and able to achieve greater abatement at lower unit cost than others, and therefore it will be a least cost strategy for those with higher marginal costs of abatement to purchase lower-cost abatement from the first group.

In the context of Chapter 5 – the Australian Policy Landscape – it is noteworthy that this city-scale program is proudly

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<sup>77</sup> Tokyo Metropolitan Government (Bureau of the Environment), *Tokyo Cap and Trade Program: Japan's first mandatory emissions trading scheme*, March 2010, p. 4.

<sup>78</sup> Tokyo Metropolitan Government, Media Release, 25 February 2016, Tokyo Cap-and-Trade Program achieves 25% reduction after 5<sup>th</sup> year, available from <file:///C:/Users/spr99/OneDrive/Documents/SPR/Projects/SPR16XX/SPR1601%20CRCLCL/Research/Tokyo%20Emissions%20Trading%20Scheme.pdf>, viewed 29 January 2017.

promoted by Tokyo as evidence of environmental leadership missing at the national level. The 2010 report cited above quotes a newspaper editorial which indicates that “...the Tokyo Metropolitan Government’s attempt is sure to influence the central Government, other local governments and companies”, and that the Tokyo Metropolitan Government was motivated to introduce this scheme because of “...its now sceptical view of the central government’s role”.<sup>79</sup> Indeed, the Report notes that the City’s scheme:

*...differs from the cap-and-trade schemes that have become the most accepted approach internationally. Major problems with the national government’s trial are that participation is voluntary and left entirely up to each company’s decision, and that no cap has been established for sectors within the scope of the program. As stated above, TMG has introduced a mandatory cap-and-trade program with an absolute cap. Tokyo’s program clearly indicates the way to go and could play a role in counteracting the disparities inherent in the Japanese government’s trial of “emissions trading without a cap”.*

As is discussed in Chapter 5, policy leadership at the sub-national level, and increasingly at the city level, is a global phenomenon, arising largely due to perceptions of inadequate responses by national governments to the threat of anthropogenic climate change.

## Non-Mandatory Measures

The non-mandatory measures discussed below are categorised in line with UNEP (2007) cited earlier. The measures include financial incentives (a large class); co-operative procurement initiatives; voluntary rating, certification and labelling schemes; public leadership; and information, awareness-raising and capacity-building initiatives.

### Financial Incentives

Many countries and sub-national governments offer many different forms of financial incentives in an attempt to influence energy and carbon emissions in the built environment. However, it is notable that compared to regulatory measures, there is much less evidence in the public domain as to the effectiveness or cost-effectiveness of these measures. Australia and, so far as we have been able to ascertain, other countries do not require the same careful and rigorous assessments of the expected benefits and costs of financial incentives as are required of regulatory proposals. One may suspect that the popularity of financial incentives as a choice of policy instrument has less to do with an evidence based suggestion of high degrees of cost-effectiveness, but rather more to do with the fact that beneficiaries of such schemes invariably welcome them, particularly if they are

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<sup>79</sup> Tokyo Metropolitan Government (2010), p. 3.

offered as an alternative to regulation (which is not always the case, as noted below), while those paying the costs (taxpayers) are more numerous, with more diffuse interests and less able to lobby effectively.

While there are many forms of financial incentives, the majority represent either direct subsidies or tax expenditures that are designed to encourage particular kinds of investment or behaviour, or else schemes designed to improve access to finance.

As a policy instrument, subsidies have the great advantage that they are (or can be) direct, rapidly introduced and highly visible. They may require enabling Acts of parliament, or may be able to be managed as a Budget line item. Particularly if the subsidy is large relative to the perceived marginal cost of the item concerned, then the consumer response can be rapid and effective. Subsidies can also be highly targeted, even to individual products or services – although in such cases, the same competition policy issues may arise as noted for building codes and other regulatory interventions. As will be discussed in Section 3.4.1 below, there can also be an important and temporary role of subsidies as part of an integrated market transformation strategy. For while we tend to think of subsidies as something provided to consumers, in fact many subsidies are also offered to producers or even market intermediaries – as for example when certain Australian car makers received subsidies for producing specific low-emissions models in Australia.

The key disadvantages of subsidies include a lack of governmental control over expenditures – and therefore impact – and the risk of ‘claw-back’ by non-targeted producers or intermediaries of subsidies meant for consumers or specific parties. Relatedly, it may be practically impossible for governments to distinguish between those who genuinely require a subsidy in order to engage in the subsidised activity and those who would have engaged in that activity without subsidies, but who are now subsidised in any case. Those in the latter category are known as ‘free-riders’.

The lack of fiscal control arises to the extent that subsidies are offered as entitlements. That is to say, anyone who meets the defined criteria is entitled to a payment. For while the government has control of the *amount* of the subsidy offered, often it has little or no control at all over the *volume* of the activity that triggers the subsidy. In some cases, various limits, caps or eligibility criteria are imposed in an attempt to target and limit expenditures – examples in Australia included the capped feed-in tariffs offered in the Australian Capital Territory. However, such criteria are often contested and difficult to set boundaries around. In the case of the Household Insulation Program subsidy, discussed further below, one question was whether aluminium foil – subsidised under the program – was even insulation at all.<sup>80</sup>

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<sup>80</sup> Foil has heat reflective qualities which, in hotter climates and subject to appropriate design and installation, can assist with heat rejection from houses, leading to reductions in cooling energy consumption. It is not, however, insulation.

Tax expenditures – or tax deductions as they are better known – face similar issues as subsidies, but the foregone tax revenue (‘tax expenditures’) is much less transparent than for subsidies. With subsidies, it is at least possible to count the volume of subsidies being taken up, and therefore to at least estimate the financial liability as it accrues. In the case of a tax expenditure, the number of taxpayers taking up the option in a given year will not be known with certainty until all tax returns are completed and analysed the following year. Practically the Budget cost of many tax expenditures – and not only in the carbon/energy field – is simply estimated.

As a result of the above factors, there is a risk that tax or budget expenditures will be generally poorly controlled, at least between budget periods. Since there is a high degree of scrutiny of Budgets by parliaments, and greater potential for transparency and administrative controls, subsidies are likely to present relatively less Budget risk than tax expenditures.

Australia infamously used subsidies for insulation – the Household Insulation Program (HIP) – as a form of macroeconomic stimulus and employment generation when, following the global financial crisis of 2007 – 08, and with concerns about spreading ‘contagion’ of failing banking systems around the world, many governments including Australia’s engaged in Keynesian or pump-priming expenditures. The much-maligned HIP was in fact highly successful in seeing an estimated 1 million Australia homes receive ceiling insulation, which is one of the most cost-effective energy savings opportunities that exists. It was also successful in its primary goal of creating employment – the 2010 Royal Commission Report notes that there were over 10,000 registered installers employing thousands of largely low-skilled workers.<sup>81</sup> However, its administration was criticised for being rushed, and with insufficient focus on safety and the prevention of fraud. To this day, only one state-based retailer obligation scheme (South Australia’s) includes top-up insulation as an allowed activity, even though it is a highly cost effective energy saving option.

What is the theory of action for subsidies? There may be two variants of the basic theory, which is that consumers will respond to a change in relative prices of goods perceived to be (potential) substitutes. The first case may be where the subsidised activity is expensive relative to alternatives that have lower energy or carbon performance. A subsidy would be expected to increase the affordability of that higher performance item, leading to an increase in demand for and consumption of that variant, and less demand for and consumption of the lower energy or carbon performance variants. An example might be hypothetical subsidies offered for high-performance glazing, where cost premiums over conventional glazing are high, but energy performance is also dramatically higher. A second but related theory of action does not assume that the subsidised activity is necessarily

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This example is offered to illustrate the difficulties of setting boundaries around subsidies.

<sup>81</sup> A Hawke, *Review of the Administration of the Home Insulation Program*, 6 April 2010.



relatively expensive, but nevertheless its higher energy or carbon performance relative to other products may induce a government to subsidise that activity, in effect to displace the less efficient product. Both are examples of 'Pigouvean subsidies', the counterpart to Pigouvean taxes discussed above. That is, the subsidised product has positive externalities associated with its consumption which, by definition, are not priced in the markets and so not fully valued by market participants. As a result, this product will be under-supplied and under-consumed relative to a social optimum, at least without policy intervention.

With the risks associated with simple subsidy programs, they have become less common over the years, particularly for Australia's national government. However, many schemes are in operation that seek to improve access to, and lower the private cost of, capital for energy efficiency investments. The theory of action is a modest but important refinement upon that for subsidies. In this case, the policy approach recognises that, even if there is a higher upfront capital cost for a more energy- or carbon-efficient solution, if that solution is cost-effective (for example, because it is regulatory in nature and has been subject to rigorous regulation impact assessment) then it will improve the investor's welfare over time...provided they can afford to finance the investment in the first place.

So rather than subsidise the purchase price by some percentage, an interest rate subsidy, loan guarantee or other form of financial aid only assists with the cost of financing the purchase. Further criteria can be applied, such as a means test or other equity criteria, to ensure that assistance with financing is only provided to those who need it. From a fiscal perspective, subsidising an interest rate margin can be a lower cost option than subsidising the purchase price, essentially because the interest rate subsidy (or, even better, loan guarantee) reduces the risk to the financial services provider. In the case of a loan guarantee, the government carries a contingent liability but will only incur an actual cost to the extent that loans default. Overall, this can provide a much lower cost option than product subsidies. Note, however, that if equity/affordability criteria are not applied, but instead the financial assistance is provided as an entitlement – contingent upon the subsidised action being taken – then it is likely to suffer from similar free-riding costs as per the subsidy model.

In the place of seeking to catalogue the myriad variations on financing policy models, we highlight what is a relatively new approach in Australia, known as building upgrade finance or environment upgrade agreements. The essence of this approach (even though details vary from scheme to scheme – versions are currently pursued in at least New South Wales, Victoria and South Australia) – is that interest rate margins are reduced, relative to general market rates, by 'derisking' the loan. This is achieved via a three-way agreement between the borrower (building owner), the financial institution and the local government authority (LGA). The LGA's role is to recover the loan payments, on behalf of the financial institution, via a rates levy on the building in question. This means that, from the finance institution's perspective, there is greater (near complete) certainty that

the borrower will not default (enabling lower risk margins to be applied to the loan), while from the borrower's point of view, it overcomes a 'bounded rationality' concern – which is that if the building were to be sold, the value of the energy efficiency investment may not be able to be recovered through the sale price. Under this model, the loan repayment remains a liability on the future rates of the building, and this is in effect inherited by the new owner.

The experience with this model in Australia thus far has been mixed. While statistics do not appear to be available, stakeholder feedback indicates that uptake of EUAs has been very slow in NSW. Late in 2016, the enabling legislation was amended and, importantly, the standard form contract very considerably shortened and simplified, and this may see greater uptake in future. In Victoria, EUAs were initially available only for upgrades to buildings in the City of Melbourne via the City of Melbourne Act 2001 – a program known as 1200 Buildings. However, the scope of these arrangements was expanded in late 2015, in part in response to slow uptake of the original offer – again, hard statistics on uptake do not appear to be published. Stakeholder advice, however, suggests that uptake has accelerated in the VIC market in the last year or so, primarily driven by 100 kW scale solar PV installations rather than efficiency upgrades.

In at least partial explanation, it should be noted that Australia is currently enjoying record low interest rates, and so it should not be surprising that schemes that further reduce interest rates, by an increasingly small amount as real interest rates fall, should not be in high demand. Indeed, it is questionable whether there would be evidence, in the current market environment, that access to capital for energy efficiency investment purposes is marred by any form of market failure or, even if so, whether that failure is material. Second, the three-way agreements are long, legally novel and complex. More parties must be involved in their negotiation, meaning higher transactions costs and timeframes. In some cases, tenant considerations must also be considered, adding a fourth party, and there are additional reporting obligations. For a borrower, the equation is whether the interest rate reduction on offer is sufficient large to more than offset these additional costs.

#### Co-operative Procurement

This measure is similar to the Procurement Requirements measure described at Section 3.2.3, except that instead of governments imposing procurement standards, entities – which may be companies but, in Australia, are generally local government – come together to pool their purchasing power and undertake joint procurements. While there are undoubtedly many such arrangements in place informally around Australia, the Regional Organisations of Councils in NSW actively promote this model for local governments that choose to participate. This can range from joint procurements for stationery, though to renewable energy contracts or energy efficiency services.

LED street lighting is another area where local governments are collaborating to accelerate the realisation of significant

energy savings. In NSW, the *Light Years Ahead* program involved joint procurement by nine Western Sydney Councils and was facilitated by WesROC, the Western Sydney Regional Organisation of Councils. This program led to almost 14,000 LED street lights being installed across Western Sydney, saving participating Councils \$20million and 74,000 t CO<sub>2</sub>-e over 20 years.<sup>82</sup> Similar schemes are running right around Australia. While the key theory of action here is economies of scale, the other benefits from this approach include rapid learning, sharing of successes and failures, negotiating leverage not only with LED lamp suppliers but, critically, with electricity network businesses (who perceive energy efficiency as a threat to their business model).

A further reason why this model works well in government, and potentially less well in the private sector, is that it involves transactions costs. Those with shared interests in procurement must first find each other and understand the extent to which they have common interests. Local government in particular already has strong sustainability networks, and typically have very similar end-use profiles. In principle this model could be adopted more widely, essentially where the expected 'search costs', as they are known, of finding and negotiating agreements with like-minded end-users are outweighed by the expected cost reductions from joint procurement. As noted in Section 3.2.3, such procurement initiatives can play a critical role for relatively new technologies, where economies of scale and a guarantee of a sizeable market, can defray marketing risks and costs and enable ramping up of production facilities – a critical component of market transformation (Section 3.4.1).

#### Voluntary Rating, Certification, Labelling

This is another very large class of policies, which reflects the fact, discussed in Chapter 2, that the energy and carbon performance of buildings and the built environment is largely invisible – except to those paying the energy bills. Indeed, even knowledge of direct (past) energy costs does not fully inform a potential new buyer or lessee of a building as to its energy efficiency, as their energy end-use demands and profiles may differ significantly from those of past occupants. This may mask the degree of underlying and inherent thermal efficiency of the building structure, which is a function of its location, aspect/orientation, design, construction materials and quality, and operating equipment and controls. For inexpert consumers, such attributes are impossible to assess without expert advice. As noted in Chapter 2, even if a prospective buyer or lessee procures such advice privately, it may not be available to other prospective buyers or lessees and may have to be repeated, while the comparability of results of such assessments – without standardised ratings, labels and certification schemes which provide for quality assurance – may be limited.

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<sup>82</sup> <https://wsroc.com.au/media-a-resources/releases/western-sydney-councils-celebrate-end-of-street-lighting-project>, viewed 30 January 2017.

In Australia, examples of voluntary ratings, certification and labelling schemes include the National House Energy Rating Scheme (NatHERS), the National Australian Built Environment Rating System (NABERS), Green Star and others. Each of these is described and critiqued in Chapter 5 below. Provided they are understandable and perceived as credible, voluntary ratings, certification and labelling schemes can help to fill this information and knowledge gap, helping to inform efficient market decisions and outcomes.

In a manner similar to mandatory disclosure, voluntary ratings, certification and labelling schemes seek to overcome information market failures. However, a key difference is that they are likely to be subject to information asymmetry, giving rise to risks of adverse selection. That is, if disclosure or certification is voluntary, those owners of buildings that they believe perform better than average have an incentive to pay the rating, certification or labelling cost, in the hope of realising a market premium, while owners of poorly performing buildings will seek to withhold this information. In theory, and in highly competitive markets only, well-informed buyers/lessees might demand this information or go elsewhere. However, when vacancy rates are low, buyers may have very limited choice and bargaining power.

For these reasons, Ross Garnaut in his *Climate Change Review* noted (p. 412) that:

*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.*

It is worth noting that there are excellent examples of voluntary, industry-led schemes (which shade into information and awareness raising, considered at Section 3.3.5 below) such as L J Hooker's *17 Things* or *Liveability* initiative, that can inform consumers about the sustainability performance of, in this case, houses. *17 Things* is essentially a check-list of sustainability features which non-experts in sustainability, including real estate agents but also home buyers, can readily verify for themselves.<sup>83</sup> This apparently simple approach is in fact based on extensive market research which, amongst other things, confirmed that:<sup>84</sup>

- *Most house buyers do care greatly about sustainability, the environment and home running costs, but are poorly equipped to distinguish good from poor performers*
- *Complex ratings tools [e.g., NatHERS] are also poorly understood by consumers and do not assist greatly in making purchasing decisions*

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<sup>83</sup> See <http://www.liveability.com.au/17things>, viewed 30 January 2017.

<sup>84</sup> Ibid; <http://www.thefifthstate.com.au/articles/lj-hooker-how-to-convert-real-estate-agents-and-start-a-revolution/57284>, viewed 30/1/2017; and personal communications.



- *House buyers are looking for features – these features may include a swimming pool and marble benchtops, but they may also include solar panels, solar hot water, double glazing, etc.*
- *Importantly, buyers do not need extensive technical information on these features – a simple checklist it may suffice to judge whether a house with 16/17 ticks is more desirable than one with 3/17 ticks.*

These observations align well with more recent economic literature, which notes that time- and information-poor buyers will utilise compressed forms of information – provided they are perceived to be credible – to support decision-making. While this approach is clearly then an advance over no or little information reaching buyers, the question for public policy – and recalling Garnaut’s advice – is whether partial and discretionary provision of information by the private sector amounts to a sufficient response to internalise the externality in question – the damage costs of unmitigated climate change. Also from an equity perspective, there seems little reason why such services should be able to be accessed by some parties and not by others. Further, from a home owner’s and equipment supplier’s perspective, partial schemes are likely to lead to less demand for and value being placed on sustainability features and technologies, when compared to universal or national schemes. This means that the market transformation effect – and therefore economic benefits – of the partial and voluntary schemes will be less.

#### Public Leadership

This is a broad class of actions that includes aspirational or ‘visionary’ target-setting, moral leadership and, of course, actions that translate these into actual outcomes. As noted above, government procurement of low-carbon or high-efficiency products and buildings would fall comfortably into this category. However, this category might best be called public leadership – or rather, leadership in the public interest – because such leadership may be shown in any sector or organisation. Leadership in the public interest involves actions that have high stringency, that inspire others to follow suit, and perhaps those that create the intangible but critical value of hope.

Target-setting is a widely-practised phenomenon in government and indeed private sector organisations. Target-setting can be empowering, particularly where a leader effectively authorises a class of actions by at least implicitly endorsing them in advance. If a company CEO calls for innovative low-carbon solutions, for example, workers within that organisation are likely to feel empowered to take risk, to offer more innovative ideas, and to accept more accountability for delivering those ideas, than they would in an organisation that is either neutral, or else actively or surreptitiously discouraging of such activity. Such cues – positive or negative – play a subtle but very important role for social beings like humans.

In Australia today, in the government sector, ambitious targets are being set by local governments and major cities, and some state and territory governments, who perceive

local community demands for action, or economic and strategic benefits, or indeed both. As an example of the former, the City of Sydney’s initial target of a 70% reduction in greenhouse gas emissions by 2030 arose from a detailed consultation with residents in 2006, who identified this as one of just a handful of strategic priorities for the city. That target has since been extended to zero net emissions by 2050.<sup>85</sup>

An example of the second category is Adelaide and South Australia. The South Australian economy has been heavily impacted by closures of its traditional industrial and manufacturing sectors, including car manufacturing, ship-building and related industries, in recent years. In seeking new and sustainable economic drivers for the economy, the South Australian Government identified the low-carbon, high-technology sectors as one of a handful of strategic development priorities. This includes renewable energy industries, related sectors such as advanced and distributed electrical storage, electric and autonomous vehicles and light rail, *inter alia*. These sectors were identified not only for their potential to provide low- and zero-carbon solutions, but also for strategic characteristics such as their potential for:

- attracting global technology corporations to invest locally
- creating high-technology and high-knowledge, value-added jobs
- significantly reduced risk of investments being made redundant by global development trends – including the global shift to low carbon.

In this context, the Carbon Neutral Adelaide project was jointly conceived by the South Australian Government and Adelaide City Council as a focus for this effort – a visionary project to make Adelaide the world’s first carbon neutral city.<sup>86</sup>

A key risk with this approach arises where leaders raise expectations that are then disappointed. A common phenomenon is that targets are set without effective mechanisms are in place to achieve them. Such targets are more likely to inspire cynicism than enthusiasm and energy. The currency of targets and indeed leadership is always credibility. Targets that are perceived as lacking credibility – either because they are too ambitious to be believable, or because they are so low as to be judged laughable – will fail to generate the hoped-for lift in creativity, effort or investment.

Information, awareness raising, education, training, skills development

<sup>85</sup> City of Sydney, *Draft Environmental Action Plan: 2016 – 2021*, June 2016.

<sup>86</sup> See <https://www.environment.sa.gov.au/Science/Science-research/climate-change/climate-change-initiatives-in-south-australia/sa-climate-change-strategy/carbon-neutral-adelaide>, viewed 2 February 2017.

In Chapter 2 we noted that many ‘market failures’ have imperfect information at their heart. This is not to say that simply providing information will automatically overcome such failures. As discussed, they are not failures in fact, but rather inherent characteristics or challenges. Some may be amenable to direct or indeed indirect information provision, or capacity building – a generic term for education, training and skills development. Others are structural in nature – such as the risk of adverse selection due to information asymmetries.

Many governments invest significantly in providing information relating to many aspects of energy efficiency in particular, and to a lesser extent carbon abatement. Information leaflets about home weatherisation, or how/why to select energy efficient refrigerators, may be found in government offices and, just possibly, in appliance retail outlets. The impact of such measures is unclear – primarily because little research appears to be done to establish the extent to which different forms of information provision are effective and cost-effective.

At the national level, there are several important websites that carry significant energy efficiency information resources, including the Energy Efficiency Exchange (<https://www.eex.gov.au/>), Your Home (<http://www.yourhome.gov.au/>) and Your Energy Savings (<http://yourenergysavings.gov.au/>).

The extent to which these resource sets are accessed and used by those contemplating energy efficiency investments is unclear. The information may exist, but published evaluations do not seem to. This contrasts with other, regulatory measures designed to address information market failures, such as product labelling and the Commercial Building Disclosure program. This seems to parallel the higher standard of assessment that we apply to regulation – that we also evaluate regulatory measures, while pure information provision, and other measures including financial incentives, appear to be evaluated much less often. Whether this is due to methodological challenges in doing so, or because of a concern that the results may be poor, or something of both of these, is also unclear.

There are generic lessons that can be drawn about the effectiveness of information provision. The first is that context and timing are critical. Information about the relative efficiency of refrigerators, for example, is unlikely to be of great interest to most people – until their refrigerator breaks down and must be replaced. Then and only then will that household be even potentially receptive to information. The following week, it would be perceived as again having little immediate value or relevance.

A second and related lesson is that the information must be available where, in addition to when, it is required. Most importantly for purchasing/investment decisions, this is at – and in the lead-up to – the point of sale. For smaller, cheaper and shorter-lived consumer goods, consumers may not undertake significant research prior to making a purchase decision – most likely because they would perceive the risks associated with ‘getting it wrong’ to be small. But for major appliances, or potentially for a house or office lease, there is

at least the potential that people will want to undertake research in advance – to compare options and weigh relative pros and cons.

In such a case – where there is the potential demand for information – then the form, understandability, quality and relevance of that information becomes important. Exercises like the LJ Hooker Institute’s *17 Things/Liveability* program, described in Chapter 5, illustrate that effective information programs are difficult to design. The meanings and connotations of particular words chosen, the formats selection, the delivery modes, will all be perceived differently by different cohorts in society – no single approach will work effectively for all. Some four years of market research, surveys, engagement and trial and error underpinned the *17 Things* framework – an ostensibly simple, but highly relevant, communication and training platform.

This indicates that *effective* information programs can hardly be considered as a cheaper and easier approach than regulation. Both require professional development and conception, careful planning and execution, and thorough review and evaluation to demonstrate and guarantee effectiveness, particularly over time. If this approach is not taken, it should not be presumed that simple communication exercises, like the preparation of case studies or other information, will be either effective or cost-effective.

In the *National Energy Efficiency Buildings Project*, Swinburne University of Technology undertook a careful assessment of building industry training and education needs. They found *inter alia*:<sup>87</sup>

- *There is an abundance of material and courses but there is no way of knowing how well they are being accessed or used.*
- *Generally, the view is that only those interested in energy efficiency are accessing information and training. For the rest, it is a case of “You don’t know what you don’t know”.*
- *Excellent training and mentoring programs are available but uptake is generally low unless it is a mandatory requirement.*
- *Appropriately written, illustrated and designed materials for both print, video and web distribution were seen as vital and to be welcomed. This was due to a recognition that information and learning resources are necessary for continuous skill updating.*
- *It was also due to a recognition that a large proportion of materials are written in technical language, without appropriate illustrations and interpretation. Further, much is too general, i.e. without specific relevance to particular phases of the construction cycle, trades or climate regions.*

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<sup>87</sup> pitt&sherry/Swinburne University of Technology, *National Energy Efficient Buildings Project: Phase 1 Final Report*, December 2014, commissioned by the South Australian Department of State Development, p. 129.

- Many organizations are providing information and training but have no means of assessing uptake or evaluating effectiveness.
- As a set, the information resources are very fragmented, uneven in quality and depth, often descriptive, and fail to provide practical guidelines for implementation by specific roles or specific climate zones.
- There is a particular need for additional support guidelines for the tropical climate zone.
- There is a vital need to develop a national program on building energy efficiency information based upon:
  - Using trusted sources
  - Well-illustrated
  - Written in a clear, simple and easy to act on way
  - Specific to climate zones
  - Specific to particular roles in the construction cycle.

The Report identified key issues as ‘the inappropriateness of current approaches to competency-based instruction’ and ‘the need for individual capacity building to be seen as but one element of a wider industry change strategy’.<sup>88</sup>

Like information programs, education and training are important but not low-cost or ‘easy’ policy options. To be effective these strategies must be well-conceived in terms of relevance and in the quality of delivery. For example, during the National Energy Efficient Buildings Project cited above, some industry associations called for information-based strategies, such as building awareness of the fundamentals of housing energy efficiency, and (therefore) the value of house energy ratings, to be prioritised over increases in the stringency of building energy standards. While improvement in the general understanding of efficiency issues, and of house energy ratings in particular, would undoubtedly be desirable outcomes – and potentially feasible to some degree, over time – it would be interesting to design and compare the two strategies side-by-side, to assess their relative costs, prospects for success, cost-effectiveness, and proportionality to the severity of the issues, including climate change but also poor consumer welfare outcomes, that are driving the consideration of higher energy performance standards.

Overall we note that, as with other non-regulatory policies, there appears to be less critical assessment and *ex-poste* evaluation of the effectiveness and cost-effectiveness of information-based policy approaches, which is surprising given their popularity.

## Policy Packages

Thus far, this chapter has focused on individual policy measures. But measures of often rolled out in groups, aiming

<sup>88</sup> Ibid, p. 139.

for the net effect of the whole to be greater than the sum of the parts. Indeed, our review of international best practices (Chapter 4 and Appendix A) finds that this is one of the defining aspects of best practice.

During the ‘carbon price era’, however, Australia witnessed an almost fevered and sustained effort to eliminate as many ‘complementary measures’ (which, in Orwellian fashion<sup>89</sup>, in fact denoted ‘non-complementary measures’) as possible. This in part accounts for the scaling back or elimination of important energy efficiency programs in the built environment such as MEPS and labelling, the National Construction Code, the Energy Efficiency Opportunities program, the Energy Efficiency Best Practice Program and others. The apparent rationale was that carbon pricing overcame all significant externalities and should be relied upon as the sole driver of change in carbon intensity. As noted in Chapter 2, this dramatically over-simplifies the myriad of factors denoted as market failures, many of which have nothing to do with pricing at all. This single-minded, single-instrument approach stands in marked contrast to virtually every other nation, including those with carbon pricing regimes, and also sets aside the concept of optimal policy. The UK, which was the first to introduce a cap and trade scheme, also maintained a carbon tax and a full and growing suite of energy efficiency measures, and this is also the case in Europe and in US states with carbon pricing.<sup>90</sup> While beyond the scope of this project to fully explore, study of this phenomenon may yield important insights into attitudes towards policy and indeed regulation amongst decision makers in Australia.

The synergies between policy measures can be strong. As discussed above, the simple provision of information, or awareness-raising strategies, may fail to reach their intended audiences unless carefully crafted and delivered, while modest subsidies or taxes may fall below a threshold that is high enough to stimulate a significant response. However, by combining these two approaches, it is likely that greater attention will be drawn to the issue in question, and a greater response generated. As also noted earlier, many of the more effective information-based measures, such as labelling and mandatory disclosure, already combine regulation and information, while also stimulating market-based responses such as enhanced competition between suppliers.

In the area of building codes, in Australia and other countries, there is considerable concern about the extent to which there is compliance with mandatory energy performance requirements.<sup>91</sup> Key explanations for this, offered by large

<sup>89</sup> George Orwell’s *1984*, first published in 1949, is regarded as a masterpiece of dystopian political literature. It coined the phrase ‘double-speak’, where words are used to connote the opposite of their literal meaning.

<sup>90</sup> See [http://parlinfo.aph.gov.au/parlInfo/download/library/prspub/2501441/upload\\_binary/2501441.pdf;fileType=application/pdf](http://parlinfo.aph.gov.au/parlInfo/download/library/prspub/2501441/upload_binary/2501441.pdf;fileType=application/pdf), viewed online on 2 February 2017.

<sup>91</sup> pitt&sherry/Swinburne University of Technology (2014).

numbers of industry stakeholders during the National Energy Efficient Buildings Project (NEEBP), include that:

- Enforcement activity, including independent auditing and verification, by regulators is virtually non-existent, leading to a culture that non-compliance is consequence-free
- Some Code provisions are complex and poorly understood in industry
- There is a lack of explanatory material, including simple diagrams, step-by-step advice and support options, to aid with resolving compliance issues.

Such criticisms point the way to (genuinely) complementary packages of measures – awareness-raising, capacity-building, changing attitudes and assumptions – or culture – through well-conceived and generally low-cost measures, in association with enforcement action and ‘signalling’.

As an example, during the NEEBP, some stakeholders noted the contrast between the ‘smart’ enforcement appliance and equipment minimum energy performance standards (MEPS) and labelling, and the absence of a similar approach in buildings. In the mid-2000s, the national MEPS program enlisted the assistance of the Australian Competition and Consumer Council (ACCC) to investigate suggestions of non-compliance with MEPS and/or labelling requirements by some manufacturers. In 2006, LG agreed to provide up to \$3.1 million in compensation for consumers who purchased five air conditioner models that carried inaccurate and misleading labels. The amount of compensation was calculated with reference to the expected additional energy costs incurred by consumers due to the products’ underperformance.

Importantly, in announcing this outcome to the market, the then Chairman of the ACCC, Graham Samuel noted:<sup>92</sup>

*The integrity of the Australian energy star rating system is important because it provides a powerful market driven incentive for manufacturers to improve the energy performance of their products", Mr Samuel said. "Consumers need to have confidence that they can use the star rating of an air conditioner to make an informed choice between competing brands.*

*The ACCC, the Australian Greenhouse Office and state energy regulators will continue working together to ensure compliance with the energy labelling system.*

This single episode, including its reminder of ongoing vigilance by authorities, is reputed to have generated redoubled compliance efforts across the entire manufacturing industry – at least for labelled products. In addition to the direct costs associated with legal proceedings, the reputational damage that such findings can generate amounts to a powerful spur for companies to comply with the law.

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<sup>92</sup> <https://www.accc.gov.au/media-release/lg-compensates-consumers-over-misleading-energy-ratings>, viewed 2 February 2017.

In this context, and noting that the energy operating costs for buildings are orders of magnitude larger than for single appliances, it is little short of remarkable that no similar action has been taken in the building sector. Without making excuses, it may be relevant for policy design that one possible explanation for this is the technical difficulty of discerning whether a given building does in fact comply with the Code. While this issue is covered in Pitt & Sherry/Swinburne University of Technology (2014), Chapter 3, the key issues include:

- A lack of transparency, particularly for commercial buildings, as to what the energy performance target actually is for any given building – this is associated with the use of a modelled ‘reference building’ as a comparator for the energy performance of the building design in question, but the key energy intensity information from this process is never revealed, frustrating any attempt at compliance auditing
- The fact that energy performance requirements apply to designs, and not to actual buildings, raising the fundamental question of whether, in fact, Code provisions are enforceable and, if so, against which party in the design and construction process?

Another opportunity for synergies between different policy models is where environmental levies are applied which may be waived if certain conditions are met. These conditions might be limited to reporting of information – such as energy consumptions or emissions intensity – which in turn allows a performance profile to be constructed and benchmarking of relative performance. Potentially at a later stage, the conditions could migrate to become minimum performance requirements, or a requirement for evidence that processes such as audits have been undertaken, or evidence of performance improvement over time. Provided the underlying activities are, on average, cost effective, such leveraged strategies will both improve welfare and improve the ability of governments deploying such strategies to make targeted and efficient policy interventions in future. This need arises, as noted earlier, due to the paucity of actual energy or carbon performance information in the public domain.

#### Market Transformation

A key policy package approach – of which there are specific examples offered in Appendix A – is known as market transformation. This approach has been fundamental to many other countries making the progress that they have towards very high energy and carbon performance in the built environment. At the same time, it is little known and has been rarely used in Australia.

Strictly, market transformation is the outcome desired, while the choice of policy instruments used to achieve that outcome is open. The American Council for an Energy Efficient Economy (ACEEE) defines market transformation as “...the strategic process of intervening in a market to create lasting change in market behaviour by removing identified barriers or exploiting opportunities to accelerate the adoption



of all cost-effective energy efficiency as a matter of standard practice.” It describes market transformation as the process of getting new, high performance products or designs to be taken up in the mainstream, without the need for ongoing support or cost.

Successful market transformation is based on a detailed understanding of market dynamics – with, if anything, a leaning towards a deep understanding of the supply side of the market, although demand considerations are important. On the demand side, we need to inquire with potential users of low carbon products/buildings what is it that they require, what is it that they do and don’t like about these products, and how could these demand side barriers be overcome.

A key case study was when the United States wished to transform the efficiency of lighting by moving away from incandescent to compact fluorescent lamps. US EPA conducted research to determine what was holding back demand for this product. Apart of price, it transpired that the key barriers were quality factors, or fitness for purpose. Consumers did not like the blue colour cast of early lamps (high temperature colour); they did not like the fact that some lamps took a long time to reach full brightness and, most importantly, they did not like the fact that they did not fit neatly into existing sockets designed with incandescent lamps in mind – compact lamps were not sufficiently compact. EPA’s solution to these challenges was to conduct a tender process for the purchase of up to 1 million lamps, provided they met a performance based specification – maximum size, time to full brightness, colour temperature and unit cost were all considerations, along with the primary criterion – energy efficiency. The result was the *sub*-compact fluorescent lamp of the type common today.



**Figure 4: Compact and Sub-Compact Fluorescent Lamps**

The International Energy Agency noted of this program, in 2003, that it achieved:<sup>93</sup>

<sup>93</sup> International Energy Agency, *Creating Markets for Energy Technology*, 2013, p. 165.

- Volume growth: The goal of one million lamps was exceeded by 50%.
- Volume and price/cost: Prevailing prices of 15-22 US\$ dropped to the range of 5-8.5 US\$ (depending on quantity purchased)
- Attribution of impacts to measures: 16 new models were brought to the market, enough to ensure supply capacity. Five manufacturers commercialised new products.
- Performance improvement: A CFL of smaller size to fit into fixture was developed.
- Programme cost: 342 000 US\$ (for research and preparations, no incentives given).

A deep understanding of the supply side of market is essential for market transformation, including expected/feasible rates of technological progress, expected rates of cost reduction as a function of scale, and the effectiveness of competition within a sector. In the US, Europe and Japan, national agencies – like the Pacific NorthWest and Lawrence Berkley National Laboratories in the US, the Joint Research Centre for the EU, and the New Energy and Industrial Technology Development Organisation in Japan – maintain close linkages with researchers and industry, and conduct ‘techno-economic’ research, for this purpose. This enables market transformation initiatives to be based on performance specifications that are challenging – well beyond business-as-usual – but not so challenging as to be undeliverable or too expensive.

A wide range of strategies can be used to achieve market transformation, from mandatory codes and performance based standards, to financial incentives, information measures and more. There is no unique solution for any given product – rather, the measures must be tailored to the unique circumstance of each product market. An example of a standards-driven approach is Japan’s TopRunner program. In over 20 product categories, minimum energy performance standards are set for the next three years based on the current performance of the top-runner – the best (most energy efficient) in its class. This approach deliberately pushes industry to innovate and compete on the efficiency performance dimension. The standards are achievable – as they are already being met by at least one product – but push the whole market to innovate to achieve the same performance standard. Repetition of this process every three years ensures that the stimulus to innovate never slackens. For companies who fail to meet the TopRunner standard, name and shame strategies are used and fines or other orders issued.<sup>94</sup>

Other examples of market transformation include refrigeration (US), air conditioners (Japan), the commercialisation of high-performance glazing, LED lighting and solar panels. In California, the UK and Europe,

<sup>94</sup> <http://www.futurepolicy.org/ecologically-intelligent-design/japans-top-runner-programme/>, viewed 3 February 2017.

mandatory standards for high-performance glazing have led to the virtual elimination of glazing strategies that are ubiquitous in Australia (single glazing, uninsulated frames), while economies of scale led to significant cost reductions<sup>95</sup>. Some successful international examples of enabling market transformation in built environment are: Energiesprong in The Netherlands and the UK; Zero Carbon Homes in the UK and the Passivhaus concept (see Appendix A).

The market transformation approach highlights that it is possible to use policies, including regulatory policies, to create strong and effective market-based incentives. Importantly, these strategies enable market forces to operate in domains – such as energy and carbon efficiency – where they did not operate, or operate effectively, before. As discussed at the start of this Chapter, ‘market-based’ or ‘economic’ measures are not a category of policy, to be contrasted with others like regulation and financial incentives. Rather, policy designers can choose to use an optimal mix of measures, regulatory and non-regulatory, to stimulate market forces and enable efficient, market-based solutions to be brought to bear on key issues, such as climate change, where markets are currently ‘failing’. As noted earlier, what is really the failure here? If markets are not delivering optimal outcomes for important societal issues, it is because we have failed to design effective policy strategies that enable them to do so. This is not a market failure, but rather an unrealised opportunity to expand and capitalise on market forces.

## Defining Best Practice

This final section examines, from a theoretical perspective, the question of what defines best practice for policy and regulatory measures. We first consider the attributes of policies that distinguish best performance, and then consider best practice features for specific policy types.

### Policy attributes

While there are many potential criteria that could be applied to answer such a question, we identify three primary performance dimensions that appear to distinguish the top performers from the also-rans:

1. *Stringency* – including considerations of the degree of impact, effectiveness, additionality and adequacy, proportionality
2. *Efficiency* – including considerations of cost-effectiveness, dynamic and static efficiency, and equity considerations such as affordability

3. *Structural change, and continuous improvement* – including the degree to which policy-induced innovations – in markets, technologies and behaviours – persist over time, policy settings remain relevant and up-to-date, and outcomes continually improve.

### Stringency

Stringency is a relative concept, akin to degree-of-difficulty or ‘stretch’, and always measured relative to a ‘without measures’ or BAU case. For financial measures, such as taxes or subsidies, it includes the size of the tax or subsidy relative to the price of the item in question before taxes or subsidies. A 30% tax is more stringent than a 5% tax. For a target or retailer obligation scheme, it would be indicated by the size of the target, again relative to outcomes that would otherwise have been expected – or ‘business as usual’ (BAU). If emissions are expected to fall by 10% over a period, then a target of 50% reduction is relatively stringent, while a target of 5% has no stringency, or additionality, at all. For a regulatory measure, such as a Code or standard, it indicates the size of the gap between expected or BAU outcomes – for example in product or building efficiency – and those required by the regulation.

For stringency, more is not always better, but then nor is less. At one extreme, a measure with very high stringency – like a high regulatory hurdle or tax rate – could exhaust the market’s ability to deliver alternative solutions, particularly at a reasonable cost and at least in the short term. At the other extreme, a very small tax or subsidy might simply be ignored, or be accepted with close to 100% free-riding, while a very low regulatory hurdle, no different from or below current or expected market outcomes, would not create any ‘additionality’ - that is, no outcomes that are additional to those expected in the BAU case. In the presence of a negative externality like greenhouse gas emissions, that externality would not be internalised with such policy stringency.

Between the extremes, and at least in principle, is a degree of stringency that delivers optimal outcomes – but again, how do we characterise this ‘Goldilocks’ level? An economist applying a social benefit cost analysis framework, such as that envisaged in *Best Practice Regulation* Guides, would answer, ‘the outcome that delivers the highest present value of net social benefits, with all externalities appropriately valued’. Indeed, Principle 3 in the COAG Guide is “Adopt...the option that generates the greatest net benefit for the community”.

In practice, there are uncertainties about key values in such an equation, particularly external values. Probably the most important of these is the value of avoided future damage associated with greenhouse gas emissions. Because the ‘damage function’ associated with these emissions is delayed in time, global in nature, and uncertain as to the value of impacts, including because of their diffuse nature, it may be practically impossible to be confident that the full marginal cost associated with emissions is incorporated. In the end – and as occurs with health impacts or risks of death or serious

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<sup>95</sup> Zero carbon Hub, Cost Analysis of Meeting Zero Carbon Standard, 2014, [http://www.zerocarbonhub.org/sites/default/files/resources/reports/Cost\\_Analysis-Meeting\\_the\\_Zero\\_Carbon\\_Standard.pdf](http://www.zerocarbonhub.org/sites/default/files/resources/reports/Cost_Analysis-Meeting_the_Zero_Carbon_Standard.pdf)



trauma, or national security considerations – we may need to take a precautionary approach and decide what we consider to be acceptable (and unacceptable) risks, and then set policy stringencies at levels that we believe will deliver the *required* outcomes, while seeking to minimise the costs (and other negative impacts) of doing so.

This top-down perspective is consistent with determining the sufficiency or proportionality of policy measures. Typically, these terms are used with the sense of ensuring that measures are not *over*-specified – e.g., that policy stringency is not higher than it needs to be, or that regulation is not applied when a non-regulatory or lower-cost measure would suffice. In Chapter 5 below, for example, we note that the objectives of Australia’s National Construction Code are framed as ‘minimum necessary standards’, with the sense that they should be no higher than necessary. However, in the presence of risks deemed unacceptable, ‘minimum necessary’ can also be understood to mean ‘do what is necessary’ to achieve the objective but, as discussed below, do so as efficiently as possible. It is just as important to ensure that measures are not *under*-specified, as it is to ensure that they are not over-specified.<sup>96</sup>

This sufficiency or proportionality test is explicit in the COAG 2007 *Best Practice Regulation* Guide. Principle 8 reads “Government action should be effective and proportional to the issue being addressed” (p. 6). The explanatory text reinforces that “Proportionality involves ensuring that government action does not ‘overreach’, or extend beyond addressing a specific problem or achieved the identified objective”. The case that policy or government action might ‘under-reach’, relatively to the severity of the problem, is not explicitly considered, but the overall guidance is, as stated, that policy should be *effective* – which is further clarified as meaning “meeting the specified objective”.

This excellent guidance stresses the importance of a very clear and ‘operable’ statement of objectives. In the National Construction Code example above, the objective is clear enough in broad terms – ‘to reduce greenhouse gas emissions’, but it provides no operational guidance on degree. How do we know how much greenhouse gas abatement should be targeted without over-reaching? Adding ‘minimum necessary’ as a qualifier does not help. By contrast, the ideas of *sufficiency* and *proportionality* – already part of the best practice regulatory framework – carry considerations such as ‘to the extent that is necessary or required to achieve the public policy outcome’. In the case of carbon outcomes in the built environment, the extent necessary must have reference to science-based targets in addition to the economics-based targets now used.

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<sup>96</sup> As explained in Chapter 5, this is essentially “to reduce greenhouse gas emissions” – but this can become tautological. What is required is an objective framed in such a way as to enable ‘sufficiency’ to be determined – such as “to reduce greenhouse gas emissions to a safe level”, or “reduce greenhouse gas emissions to

## Efficiency

In the context of policy and regulation, *efficiency* indicates the extent to which a measure minimises costs, unintended side-effects, delay or other impacts judged to be undesirable, while achieving the desired or necessary outcome. It is important to emphasize the latter, because – on the surface – there is the risk that the policy option that minimises costs is the one that achieves the least. Of course, that option will not be the lowest cost option from a social perspective, as it will fail to deal with the underlying issue and therefore will not optimise social well-being.

In engineering, efficiency refers to the amount of work done (or output created) per unit of input. As a property of policy measures, it refers to ‘getting the job done at least cost’. Getting the job done was covered above under headings such as ‘effectiveness’ and ‘adequacy’. If we make public policies to target an important and material outcome or objective (noting this is assessed for regulatory measure in regulation impact assessment), then we have right to insist that those policies are effective in achieving those outcomes or goals. Assuming that this is the case, then we want these outcomes to be achieved at least cost, because there are other valuable social outcomes that could be secured with these resources.

Economics distinguishes static from dynamic efficiency. Static efficiency represents an outcome which, at a given point in time, makes use of available economic resources in such a manner as to produce the highest possible social value (that, market value plus external values). Dynamic efficiency adds to this equation by introducing the arrow of time. This can be illustrated at the level of a firm by considering an investment in innovation. A decision not to invest would reduce costs and increase profit in the short term: it might achieve static efficiency. But if the firm fails to invest in innovation, and other firms do, then it may quickly find that its product is no longer saleable in the market and it may be forced to exit the market altogether. Accounted for over time, the decision to invest in innovation may yield higher economic value and achieve the condition of dynamic efficiency.

In policy design, static efficiency – achieving short term outcomes at least cost – represents a sound general aim, but not to the exclusion of achieving the necessary outcome over time. As with the firm, governments need to be willing to make strategic decisions and investments, and accept higher costs in the short term, to create the conditions for lower cost and more effective outcomes over the longer term. Indeed, it is worth recalling the technical definition of the phrase “short term”, as used above. It means the period in which the production capacity of suppliers – but also the technology mix – is fixed. As soon as there is investment, innovation or both, new possibilities and new optimums arise. So, a key dimension for assessing the value of policy interventions is the extent to which they induce innovation and dynamic efficiency.

Importantly, there is evidence that high standards drive high degrees of innovation over time, while low standards drive low rates of innovation. This dynamic efficiency effect was

well-documented by Porter in *The Competitive Advantage of Nations*, which correlates broad economic success with the rate of innovation.<sup>97</sup>

In the example above of a firm considering an investment in innovation, a limiting factor might be that firm's ability to finance the costs of innovation before a return is achieved, including managing the costs of unsuccessful innovation. Similarly, for policy measures more generally, and regulatory measures in particular, a limiting factor may be affordability constraints or concerns. In terms of government budget constraints, public finance theory offers solutions. Governments should be willing to borrow now to improve welfare over time, with future economic growth to generate the fiscal income required to repay the loan. However, governments may hesitate to make policies which, even if cost effective over the longer term, impose costs on society in the short term which some at least may find difficult to finance – particularly those on low incomes.

Equity is an important consideration in policy design. Where a solution is otherwise optimal but would deliver poor equity outcomes, it may be necessary either to modify the policy – potentially foregoing some of its potential benefit – in order to 'purchase' acceptable equity outcomes, or else take offsetting measures to compensate those who require it. Affordability or equity concerns should not, however, prevent governments from taking necessary decisions, including responding adequately to significant public threats such as climate change. Overall welfare would be better served by responding the threat and compensating those disadvantaged and who require assistance, rather than incurring an economy-wide and potentially catastrophic loss that will impact on all, and potentially impact harder on those on lower incomes.

#### Structural change and continuous improvement

If policy interventions target significant public policy outcomes, in line with best practice guidelines, then important attributes of successful or best practice policies will include that their effects are not immediately reversed if the policy stimulus is taken away, because the measure has worked a permanent or at least long term solution. Consider a measure that subsidises a polluter for withholding a certain pollutant, or indeed one that taxes the release of the pollutant. To achieve the desired outcome, and in the absence of structural change, the subsidy or tax might need to be maintained in place indefinitely. However, if instead the polluter was assisted to change the production process – perhaps to invest in new production equipment and/or a new production process – so as to eliminate the risk of pollution altogether, then a structural change has been worked. Even if the subsidy or tax were then removed, there would be little risk of the pollution problem re-occurring, as the polluter is unlikely to scrap the new plant and reinstate the old.

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<sup>97</sup> Michael E. Porter, *The Competitive Advantage of Nations*, New York Free Press, 1990.

In the example of market transformation, a key goal is to be able to take policy stimulus away and leave behind a market place that is structurally change, to the degree that it is unlikely to revert to the initial state that justified the intervention in the first place. Very often the key to this is innovation, as noted, because newer, more efficient products often deliver better services at lower cost. Regardless of the price of bakelite telephone handsets, few of us would give up our smartphones to go back to that solution. Clearly many innovations and market transformations occur without government intervention – because the value proposition of the innovation is compelling to consumers. However, as discussed in Chapter 2, where there are important values that are not adequately expressed in market transactions, then we have no reason to suppose that market processes will automatically or serendipitously deliver optimal solutions. In such cases, we do not need to abandon market – we need to regulate them in ways that enable market forces to deliver the societal outcomes required.

But also in Chapter 2 we noted that some characteristics of the built environment denoted as market failures may persist over the long term. In the case of the climate change externality, while a zero-carbon global economy can be imagined, it is at best many decades in the future. Therefore, for the foreseeable future, policy interventions will be required to correct for this market failure. In such a case, it may not be realistic to aspire to completely remove a policy instrument, or to declare success after a modest improvement. Rather, the qualities that are required of our policies in these areas include adaptability, resilience and responsiveness to changing market conditions, and continuous improvement.

To return to the market transformation example, successfully replacing incandescent lamps with sub-compact fluorescent lamps was a considerable achievement, and we want to know that the structural change to the more efficient lighting solution is permanent, in the sense of unlikely to revert to the previous, unsatisfactory state. But if our long term goal is effectively zero carbon, then we have a long way still to travel. Rather than remove the market transformation program for lighting, we want to shift its focus to the next opportunity – such as solid state or LED lighting – and then on to the next opportunity after that. The underlying quality we are seeking is continuous improvement – at least until our long-term objective – a climate that stable and safe for humans and other species – is achieved.

For a regulatory measure like a building code, or indeed any performance-based standard, the feasible and economically optimal standard is continuously changing. The availability and performance of technologies changes, the cost of technology changes, the financial benefits change (for example as energy prices change in real terms), new designs emerge and preferences change. Best practice policies are those that are responsive to and accommodate such changes, and ideally in a reasonably automatic and timely manner. Those that remain static while economic conditions change – like Australia's building code and many product and appliance standards have done – become increasingly ineffective and irrelevant.

These considerations highlight that best practices are not only about designing optimal policy interventions, but also about the governance and policy change management processes that frame these interventions, and how effective those processes are over time.

***Appropriate policy governance***

The particulars of policy governance in Australia are discussed in Chapter 5, and touched on elsewhere in this report. To describe best practices in this area, drawing on international and domestic case studies, in many ways repeats the above considerations. Policy processes must be sufficiently effective to oversee the development and implementation of policies that are effective, with appropriately high stringency or ambition, and that are sufficient to respond to the underlying nature of the climate change and other externalities. These policy processes must also deliver the efficiency, static and dynamic, to ensure that policies remain affordable and that overall welfare is maximised. And policy governance must be such that it achieves the required structural changes and continuous improvement until our long term goals are met. To the extent that this is not the case, it begs the question whether our policy governance processes are optimal.

## 4. The Policy Landscape Internationally

This Chapter briefly summarises the key features of the policy and regulatory environments for the built environment that exist in parts of Europe, North America and the Asia Pacific. It is far from a comprehensive survey, but draws on the case studies set out in Appendix 1.

### Europe

The European Union (EU) is generally considered the world leader in establishing wide reaching, ambitious and effective policies to transform energy use in the built environment. It has a long history of setting ambitious emissions reduction targets and recognising the contribution that the building sector must make to realise these targets. The most recent commitment being to cut CO<sub>2</sub> emissions by at least 40% by 2030, with a 30% energy efficiency target.

#### EU Directives

The EU is unique in having been able to create a collective mandate across its 28 member states to prioritise the development and implementation of seminal building policies through the issuance of EU law. The Energy Performance of Buildings Directive (EPBD) was first introduced in 2002, updated in 2010 and then further strengthened by the Energy Efficiency Directive (EED) in 2012.

Practically speaking, the combination of Directives has placed the following obligations on the member states:<sup>98</sup>

- To establish a mandatory building labelling and disclosure program for all building types – with energy performance certificates required at the point of sale or rental.
- To establish a building energy code – setting minimum energy performance requirements for new buildings and major retrofits – minimum performance to be set at a cost-optimal level over the economic life of the building – with the target that all new buildings be nearly zero energy by the end of 2020.
- To establish an HVAC inspection program – including regular inspection of boilers (> 20 kW) and air conditioning systems (>12 kW) or put in place equivalent measures.
- To establish minimum requirements for government buildings – including the requirement to make energy efficient renovations to at least 3% of buildings owned and occupied by government per year, to only purchase highly efficient buildings, and that all new government buildings be nearly zero energy by the end of 2018.

- To establish an energy efficiency obligation program – requiring all energy providers to produce savings of 1.5% of their energy sales per year through implementing customer energy efficiency measures.
- To establish a mandatory auditing program for large energy users – requiring large energy users to undertake regular audits.
- To develop lists of national financial measures to improve the energy efficiency of existing buildings.
- To develop long term national building renovation strategies.
- To develop and report on National Energy Efficiency Action Plans every 3 years.

The implementation of the Directives is policed by requiring regular reporting by members on their implementation progress on a 3-yearly basis through their National Energy Efficiency Action Plans.

While implementation in some cases has been slow (taking up to six years for some member states to implement the labelling directive), the result is that all member states have established the following programs: mandatory disclosure and building labelling; minimum performance building codes; energy provider obligation schemes (or equivalent); HVAC inspection programs (or equivalent); and mandatory auditing for large energy users. Arguably the integral policies in any policy package for decarbonising the built environment.

In addition to issuing directives and monitoring their implementation, the EU also plays a support role through the provision of the programs below.

- Information sharing and capacity building:
  - Concerted Action EPBD – a forum to promote dialogue and the exchange of best practices between countries
  - BUILD UP Skills – provides training to increase the number of qualified workers able to undertake energy efficient building renovations and build nearly zero energy buildings
  - BUILD UP Portal – provides a forum in which experts share information on best practice
- Financing:
  - EU Horizon 2020 – supports research, demonstration and market up-take of energy efficient technologies
  - Project development assistance facilities to support the development and launch stages of ambitious and replicable energy efficient projects.
  - European Energy Efficiency Fund (EEEE) – €265 million fund, provides debt and equity instruments to local, regional and national public authorities
  - Private Financing for Energy Efficiency instrument (PF4EE) – financial instrument which co-funds energy efficiency programmes in EU countries

<sup>98</sup> <https://ec.europa.eu/energy/>

- European Structural & Investment Funds (ESIF) – more than €27 billion to support the shift towards a low-carbon economy
- Energy Efficiency Financial Institutions Group (EEFIG) – set up with UNEP Finance Initiative to engage with financial institutions to address challenges in accessing long-term financing for energy efficiency
- Investor Confidence Project - Europe – aims to develop a set of best practice standards for renovating buildings so as to reduce transaction costs and make risk manageable for investors

Beyond the requirements for the integral policies set in the Directives, the development and implementation of complementary building policy and incentive schemes is the responsibility of the member states. The choice and breadth of policies and incentive schemes differs significantly between countries. Voluntary standards and financial incentives are discussed further below.

#### Voluntary standards

Voluntary high performance building standards have played a role in incentivising the construction of high performance buildings in the EU. There are a number of successful voluntary standards used within and between countries in the EU, including Passive House, Minergie, and Effinergie.<sup>99</sup>

- Passive house was developed in Germany in 1990 and has now expanded worldwide, with over 50,000 buildings certified to the standard. The EU has run a number of programs to incentivise the uptake of Passive House and better understand the associated cost differentials.
- Minergie was developed in Switzerland and now consists of four separate certification standards, Minergie for high performing buildings, MINERGIE P for very high performing buildings (Passive House equivalent), a green building standard and a high efficiency building materials/equipment standard. More than 18,000 buildings have been built to the Minergie standard, with over 850 being built to the MINERGIE P standard, representing 13% of all new buildings and 2% of refurbishments certified in Switzerland.
- Effinergie was developed in France and included a BBC-Effinergie designation, a high performance standard which was recognised by public authorities and later became the minimum requirements under the French building code following implementation of the EPBD.

#### Incentives

Financial incentive programs are the most commonly utilised programs in EU countries. With all member states running grants and/or subsidies programs, and the majority also

running tax and loan programs<sup>100</sup>. These programs can be broken down by the market actors they target:

- Manufacturers – through technology purchasing and market transformation programs
- Construction industry – through demonstration projects, information sharing programs, tax reduction for energy efficient products
- Building owners – through tax credits, low-interest loans, grants
- Low income households – through weatherization programs
- Renters – through on-bill financing.

The concern with incentive programs is that the incentives alone are not significant enough to drive deep retrofits within existing building stock. The challenge in the EU remains how to effectively mobilise the market for deep renovation of existing building stock.

## North America

The USA has a long history of considered energy-efficiency policy, with early initiatives introduced for reasons of energy security in response to the oil crises in the 1970s. Today the US is regarded as having a robust infrastructure of building energy policies.

Under the USA federal system, the states are responsible for the development and implementation of building energy efficiency programs beyond the model codes, equipment minimum energy performance standards and ENERGY STAR, which are wholly developed and run federally. The federal Department of Energy (DOE) however, plays an important role in the development and provision of resources and tools to support the state and local governments' development and implementation of policies at the local level.

#### Building codes

The US has two model energy codes, the International Energy Conservation Code (IECC) (which applies to all buildings), and the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 90.1 (which applies to commercial buildings). These codes are reviewed and updated on a three yearly cycle. There are statutory requirements for the states to consider the adoption of the base codes. On DOE announcing a new model code, the states have two years to revise the energy efficiency provisions of their codes to ensure they meet or exceed the model codes, or submit an explanation to the Secretary of

<sup>99</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*.

<sup>100</sup> BPIE (2011), *Europe's Buildings under the Microscope: a country-by-country review of the energy performance of buildings*.



DOE as to why they will not meet these minimum requirements<sup>101</sup>.

Through the Building Energy Codes Program (BECP), DOE plays a central support role, providing technical assistance to state and local governments to help facilitate the adoption, implementation and compliance processes. This support includes tracking state adoption status, coordinating activities among stakeholders, technical analysis and the development of materials and tools (including those to help achieve, document and verify compliance with energy codes).

Beyond the energy codes are stretch, green, or sustainable codes and rating programs (and associated labelling programs). Progressive states and local jurisdictions are going beyond baseline energy codes and adopting 'beyond code' programs either as minimum codes or as a component of a program that provides incentives to those who comply.

#### Mandatory building disclosure

Many states and local governments have mandatory building disclosure programs in place for commercial buildings. 11 states and approximately 26 local governments have mandatory disclosure programs in place. The large number of these (10 of the state schemes and 1 city scheme) apply to government/public buildings only, with the remaining being a combination of government, commercial buildings and multi-family buildings. Austin Texas has the only scheme that covers the full residential sector<sup>102</sup>.

#### Voluntary disclosure tools

Although there is a lack of mandatory disclosure policies for the residential sector in the US, there are a number of voluntary building labelling programs that have gained significant market share. These include the Home Energy Rating System (HERS), ENERGY STAR for Homes, and the US DOE Home Energy Score.<sup>103</sup>

- HERS is an asset rating tool which rates buildings on a scale of 0 to 150, with 0 being a zero energy building, 100 being a HERS reference building (based on the IECC), from which each 1 point decrease/increase corresponds with a 1% decrease/increase in energy usage, compared to the HERS reference home. HERS is the most widely used residential rating tool in the US and is required under other programs (for example ENERGY STAR for Homes certification and for an energy-efficient mortgage).
- ENERGY STAR for Homes is a high-performance building label for new residential buildings. Market penetration of the label has been significant, with more than 1.2 million homes certified, representing 25% of all new

singles family dwellings constructed in 2010, and 77% of new homes in the state of Hawaii in the same year.

- Home Energy Score is a recent rating system developed by DOE to allow a very basic comparison of energy performance of houses. It is an asset rating that provides a score of 1 to 10, 1 being a building in need of extensive upgrades and 10 being a very high performing building. To generate a rating an assessor makes a brief site visit and uses a free online scoring tool with 45 data points to estimate energy performance, produce a rating and provide recommendations for improvements.

Voluntary commercial building rating tools include ENERGY STAR Portfolio Manager, ENERGY STAR Buildings, and ASHRAE Building Energy Quotient:<sup>104</sup>

- ENERGY STAR Portfolio Manager is a free commercial building benchmarking tool, rating a building from 1 (worst) to 100 (best) compared to similar buildings. It has an online interface that allows the user to track energy and water consumption in a building, or portfolio of buildings. It is the most widely used commercial benchmarking tool in the US and utilised by many of the mandatory disclosure programs, with more than 1,95 billion m<sup>2</sup> of space covered. Originally only developed for office buildings, it has since been expanded to be able to benchmark 15 types of commercial buildings.
- ENERGY STAR Buildings is a high-performance label for commercial buildings. In order to be certified, a building must be awarded a rating of 75 or higher using ENERGY STAR Portfolio Manager. In 2012 more than 12,600 buildings had earned the label (representing more than 185 million m<sup>2</sup>).
- ASHRAE Building Energy Quotient is a tool that compares buildings based on their energy use intensity. Using both asset and operational methodologies, the system is intended to demonstrate how optimally a building operates (operational performance) compared to its potential (asset performance).

#### Utility obligation schemes

More than half the US states have utility obligation programs in place (known as energy-efficiency resource standards (EERS)), which set electricity or natural gas savings targets to be achieved through customer energy efficiency programs. The four most common programs include:<sup>105</sup>

- Tiered incentives – offered to builders to build to ENERGY STAR or other high performance levels, such as to stretch code.
- Equipment incentives – incentives to include high efficiency equipment (e.g. HVAC, lighting, onsite

<sup>101</sup> [www.energycodes.gov](http://www.energycodes.gov)

<sup>102</sup> [www.buildingrating.org/jurisdictions](http://www.buildingrating.org/jurisdictions)

<sup>103</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*.

<sup>104</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*.

<sup>105</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*.



renewable energy generation) in new ENERGY STAR homes.

- Rating incentives – paid to the builder or rater to cover the cost of ENERGY STAR ratings.
- Homeowner discounts – paid as energy bill discounts to homeowners of ENERGY STAR homes.

The Home Performance with ENERGY STAR program delivers home energy audits and upgrades through third party assessed contractors. The program is funded by sponsors (including utilities), which offer a wide range of incentives including rebates, low interest financing and on project financing. There are many other similar programs that look at retrofitting existing buildings, with rebates of between \$1,000 and \$4,000 available.

#### Tax incentives

The US has also widely used tax incentives to drive energy efficiency improvements. For example the Energy Policy Act of 2005 established the following tax incentives:

- For purchase of high performance products that had less than 5% market share at the time.
- Tax credits to builders of residential buildings who build to high performance code such as ENERGY STAR.
- Tax credits for home owners who upgrade their building envelope through purchase and installation of insulation, window and roofing materials.
- Tax incentives for owners of new and existing commercial buildings who reduce HVAC and lighting use by 50% from ASHRAE standards.

#### Financing mechanisms

Financing mechanisms are available at the state level. Notable models include on-bill financing and property-assessed financing.

- On-bill financing is available in approximately 20 of the states, and allows upfront cost of energy efficiency upgrades to be paid off over time through a change on a customer's energy bill. The two models allow either the utility or other 3<sup>rd</sup> party to incur the initial cost of the upgrade<sup>106</sup>.
- The majority of states have also adopted legislation to allow property-assessed clean energy (PACE) financing, which allows loans for efficiency upgrades to be paid off over a long timeframe (up to 20 years) through land tax payments. More than 100,000 home owners have accessed PACE financing since its introduction in 2009.<sup>107</sup>

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<sup>106</sup> <https://energy.gov/eere/slsc/bill-financing-and-repayment-programs>

<sup>107</sup> <https://energy.gov/eere/slsc/downloads/updated-guidelines-residential-pace-financing-programs>

#### Challenges

A key challenge in the US remains the existing building stock and how to accelerate building renovation and incentivise deep retrofits.

#### Asia Pacific

Given the sheer diversity of countries in the Asia Pacific region and their varying political, social, cultural, and economic environments, it is very difficult to generalise about the effectiveness of their efforts to drive energy efficiency in the building sector. It is notable however that there are a number of countries in this region that are widely considered to be at the forefront of development and implementation of policies and policy packages designed to drive energy efficiency and decarbonisation of the built environment.

The American Council for an Energy Efficient Economy has recognised the following Asian countries as leader through their rankings in the 2016 International Energy Efficiency Scorecard, including:

- China – which scored 6<sup>th</sup> overall and third in the buildings category
- Japan – which scored 2<sup>nd</sup> overall and 14<sup>th</sup> in the buildings category
- South Korea – which scored 8<sup>th</sup> overall and 13<sup>th</sup> in the buildings category.

While Singapore was not included in the evaluation, has been chosen as a case study in this report due to its goal to actively position itself as an international leader in green building.

What these countries seem to share is a political and societal willingness for decisive federal action, and in many cases far reaching regulation.

#### China

China is a rapidly developing country and its policy environment has evolved to reflect its rapid economic and social change. While coming relatively late to the implementation of policy to drive energy efficiency in the built environment, China's package of energy efficiency policies is now recognised as one of the most comprehensive and ambitious in the world. With China recently scoring sixth in the ACEEE 2016 International Energy Efficiency Scorecard overall, and third (tied with France) in the buildings category, behind Germany and the United States.<sup>108</sup>

In 2016, China announced its 13<sup>th</sup> 5-year plan to address economic and social development through to 2020. This included a commitment to cap energy consumption for the 5-year period leading up to 2020 to 4.3 billion tonnes of coal equivalent, and reduce energy intensity by 15% from 2015,

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<sup>108</sup> American Council for Energy-Efficient Economy (2016), *The 2016 International Energy Efficiency Scorecard*

representing 560 Mt of energy savings per year. This is in addition to China having ratified the Paris climate change agreement and having earlier submitted an intended nationally determined contributions proposal to the UNFCCC of reducing greenhouse gas emissions by 60-65% from 2005 levels by 2030.

### Building codes

For rapidly developing countries like China, building codes play an even more integral role in ensuring the decarbonisation of future building stock, as the rate of construction of new buildings is such that a very large percentage of buildings that will exist in 2050, are yet to be constructed. China has established building codes for both the residential and commercial sectors that involved a stepped process of development and implementation, starting with a residential code for the heating dominated climate zones in the late 1980's, and finishing in 2005 with the expansion of a commercial building code mandatory for all climate zones.

The codes are notable for the following:<sup>109</sup>

- They are standalone codes, separate from other buildings codes such as safety and fire codes.
- Cover construction, expansions/additions, and retrofits.
- Prescriptive approach for lighting and HVAC, with performance based envelope requirements where prescriptive requirements are not met.
- Code implementation and compliance, which while still remains a significant challenge, is a focus of the policy through:
  - Being managed and supported by a central body (MOHURD), which is also tasked with monitoring and reporting of compliance levels.
  - Requirements for regular inspections and testing throughout the approval and construction process to ensure compliance with energy efficiency standards.
  - Once construction is completed and prior to receiving an occupation permit, the developer is required to submit a completion report including results of inspections and testing. MOHURD have developed a checklist detailing items that must be inspected as part of the completion report.
  - Projects that are not able to demonstrate compliance with the standards are considered illegal constructions that cannot be sold or occupied, and can be liable for other penalties, including revocation of licenses, imposition of fines and requirements to correct non-compliance.

- This essentially makes compliance with energy efficiency standards as important as the safety related building codes.

### Building rating tools

China has two main rating tools, the Green Building Evaluation and Labelling (GBEL) Program, and the Building Energy Efficiency Evaluation and Labelling (BEEL) Program, both of which were developed by MOHURD in 2008.<sup>110</sup>

- GBEL is a green building tool which rates a building from one to 3 stars for sustainability performance in energy efficiency, land use, water efficiency, construction materials, indoor environment quality, and operational management.
- BEEL rates buildings on a scale of one to five stars on energy performance alone, taking into account HVAC efficiency, lighting systems, building envelope, compliance with mandatory standards, and additional efficiency features.

The Chinese tools stand out in that they allow for both modelled and operational ratings. In the case of the BEEL, both ratings are required to be displayed on the label. The two programs are linked in that a BEEL rating is required to attain a GBEL rating.

While BEEL and GBEL ratings are largely voluntary, for certain building types it is mandatory to get and display a BEEL rating, including:

- New government-owned and commercial office buildings greater than 20,000m<sup>2</sup>
- Existing government and commercial office building applying for government subsidies to upgrade the building
- Demonstration projects
- Buildings that want to achieve a GBEL rating.

### MEPS

MEPS is a good example of the aggressiveness and ambition of some of the Chinese policies. While MEPS were first introduced in China in 1989, they only covered a small number (8 products) of high energy consuming household appliances. In 2012 China launched the ambitious Hundred Energy Efficiency Standards program, in order to accelerate the development of efficiency standards, with the aim of adopting 100 energy-saving standards (including MEPS) by the end of 2012. The first phase was extremely successful, and a second phase was introduced with the aim of adopting another 100 standards in 2014 and 2015. China's MEPS program is now one of the largest in the world with a total of 57 MEPS (15 household appliances, 13 lighting, 14 industrial

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<sup>109</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*

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<sup>110</sup> Levine et al (2012), *Building Energy-Efficiency Best Practice Policies and Policy Packages*

equipment, 5 office equipment and 10 commercial equipment).<sup>111</sup>

China has also recently announced that it will now implement a Top Runner program, similar to the program in Japan, where the label of 'top runner' is given to the best performing product in a category, and the other products in that category are required to reach the same level of performance within a set period of time. Top runner standards will apply to end-use products, energy-intensive sectors and public institutions.

#### *Incentive schemes*

China has a number of successful incentive schemes at the federal level, which have up until now largely focused on the provision of upfront subsidies.

- Weatherisation of residential buildings, focusing on insulation, heating meters and temperature control devices, heat source and networking pipeline retrofits etc. With a target of retrofitting 20 billion m<sup>2</sup> by 2020 (representing 25% of total building floor area in Northern China), which will save an estimated 57 Mt CO<sub>2</sub>e. Having met interim target of 150 million m<sup>2</sup> by 2010, with estimated savings of 5.2 Mt CO<sub>2</sub>e.
- In combination with its MEPS and mandatory energy labelling of many types of products and equipment, the central government provides grants and subsidies for the purchase of residential appliances and equipment, spending USD\$4 billion in 2012 on the promotion of air-conditioners, refrigerators, washing machines, televisions and water heaters.
- Commercial building demonstration projects. Including subsidies for demonstration projects to encourage the uptake of new technologies such as solar PV and water heaters, and ground- source and water-source heat pumps. Covering up to 50% of upfront costs.
- Commercial building subsidies for establishing end-use monitoring platforms.

Following the 13<sup>th</sup> 5-year plan, China plans to start moving away from programs that rely on up front government subsidies, towards more market based approaches such as providing risk guarantees for ESCO financing and energy efficiency lending more broadly.

#### *Industrial initiatives*

A large part of China's success in achieving energy savings is due to substantial initiatives it has introduced to target improvements in the industrial sector. The Chinese

government has aligned policies with the longer term objective of moving away from heavy energy intensive industry to higher value sectors, and has actively decommissioned industrial plants including those involved in iron, steel and cement production.

The government also introduced the Top 1,000 Program in 2006, which was expanded to the Top 10,000 Program in 2011. This program mandates energy savings for the largest 10,000 enterprises including<sup>112</sup>:

- Set energy savings targets.
- Incorporation of energy targets into the performance evaluations of executives in these companies.
- Differentiated electricity pricing and surcharges for poor energy performance for high intensity sectors.
- Establishment of a dedicated energy efficiency fund to support mandated companies.

The initial and expanded programs have been extremely successful, delivering 105 Mt of saving annually up to 2011 and 210 Mt annually to 2014, higher than the revised target of 175 Mt annually at the time of expansion.

#### Singapore

As an island state Singapore's policy environment has been predicated on a history of energy security issues, being highly dependent on the import of energy and fuels. Building performance has long been considered a necessary tool to mitigate reliance on imported fuel. In fact Singapore has actively positioned itself as a world leader in sustainable building, and has committed to action on climate change more broadly, having ratified the Paris Climate Change Agreement, committing to reducing its emissions intensity by 36% below 2005 levels by 2030.

Singapore has an established Green Building Masterplan (GBM), which is a roadmap for greening 80% of its building stock by 2030. The roadmap sets out a planning framework through a comprehensive package of policies including minimum performance requirements, green building labelling/rating, incentives, capacity building programs and research and development support for building technologies. Strategic elements established to achieve this goal include the public sector taking a lead and profiling Singapore as a green building hub.<sup>113</sup>

A multi-agency committee, the Energy Efficiency Programme Office, has been established to ensure the implementation of the roadmap and energy efficiency activities in various sectors, including households, appliances, transport and industry.

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<sup>111</sup> Fridley et al (2016), *Impacts of China's 2010 to 2013 Mandatory Product Energy Efficiency Standards: A Retrospective and Prospective Look*, ACEEE Summer Study on Energy Efficiency in Buildings conference paper.

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<sup>112</sup> International Energy Agency (2016), *Energy Efficiency Market Report 2016*

<sup>113</sup> <http://www.bigee.net/en/>

### Green Mark

Much of Singapore's framework is based on the green building rating tool Green Mark. Singapore introduced the voluntary Green Mark Scheme (GM) in 2005 with the aim of increasing awareness in sustainable buildings. The tool is a broad sustainability tool, covering a number of categories including energy efficiency. It stands out for the inclusion of minimum requirements for each of the individual categories so that better performance in one category cannot be used to offset poor performance in another category with energy efficiency being the most highly weighted category.

The tool allows for the rating of various types of buildings and infrastructure (such as new and existing residential buildings, non-residential buildings, new and existing parks, existing schools, restaurants, supermarkets, etc.) and awards certificates to indicate the level of sustainability performance - GM certified, gold, gold plus and platinum.

The tool is then called up as a requirement in regulation and complementary incentive programs, such as those discussed below.

#### Government leading by example

The government is leading by example, and has set the requirement that all government buildings must be GM gold plus certified by 2020, among other measures that position the public sector as a role model for construction industry in Singapore.

#### R&D and green building leadership internationally

Singapore wants to actively position itself as the regional hub for green building technologies and a leader in green building internationally. It does this through a variety of initiatives focusing on supporting local research and development, and establishing international events and partnerships. Through:

- An established fund, the Research Fund for the Built Environment, which offers financial support to private and public research and demonstration projects. Past projects have included both the first new build 'carbon neutral' building and the first retrofitted zero energy building in the region, both of which were completed in 2009.
- Running an annual international green building conference, and partnering with research institutions worldwide.

#### Regulatory measures

Singapore has taken a staged approach to the implementation of regulation to improving the efficiency of building stock, with 3 major policies being enacted under the

Building Control Act to mandate minimum performance requirements for new and existing buildings<sup>114</sup>.

- 2006 1<sup>st</sup> GBMP – enacted the Building Control (Environmental Sustainability) Regulations 2008, focused on improving efficiency in new builds and renovations that affect a gross floor area of 2000m<sup>2</sup> or more, by setting minimum standards.
- 2009 2<sup>nd</sup> GBMP – updated legislation in 2012 to green existing buildings to reach target of 'greening' at least 80% of building stock by 2030, including minimum performance requirements for large buildings at the point of installation or replacement of cooling system.
- 3<sup>rd</sup> GBMP – updated legislation in 2014 to require the phase in of mandatory disclosure for all buildings.

#### Building codes

Singapore has minimum energy performance codes for air-conditioned commercial buildings greater than 500m<sup>2</sup> and air-conditioned residential buildings greater than 2000m<sup>2</sup>. They set minimum requirements based on an envelope performance value which considers construction materials and heat gain (according to a facade's aspect).

#### Mandatory building disclosure and minimum performance requirements for existing buildings

Singapore has what is widely considered world leading policy in regards to setting minimum standards for existing buildings. All large commercial and industrial buildings (15,000 m<sup>2</sup> or greater) are required to meet minimum Green Mark Certified standards at the point of installation or replacement of cooling and ventilation systems. In addition to this they are required to undertake three-yearly energy audits of a building's cooling systems, ensuring the system continues to operate efficiently and comply with standards.

Annual submission of building consumption data is also required for all commercial and industrial buildings, regardless of size. This information is used to benchmark the building stock, and is accessible by all building owners, allowing direct comparison and encouraging energy upgrades. To avoid difficulty for building owners collecting and aggregating tenant utility bills and ensure data accuracy, Singapore has mandated that utility suppliers provide energy consumption directly to the Authority.

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<sup>114</sup> C40, 2014, *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities*, [www.c40.org/blog\\_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report](http://www.c40.org/blog_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report)

## Residential

On the face of it Singapore would seem to have very little in the way of policy directed at the residential sector. That is however not the case as the Housing Development Board (HDB) has de-facto responsibility for energy policy in the residential sector as it is responsible for public housing which accounts for over 90% of all residential buildings in Singapore. Going beyond the 80% goal the HDB has set separate targets for improving the efficiency of existing buildings by 30% in older estates and 20% in newer estates.

## Incentive schemes

There are a number of financial assistance schemes designed to incentivise high performance buildings:

- The GM Gross Floor Area Scheme allows buildings that are designed to achieve a GM gold plus or platinum rating to be granted additional floor area, which is otherwise limited by planning regulations.
- Green Mark Incentive Scheme for New Buildings provides grants for new commercial buildings that achieve a Green Mark Gold or higher certification.
- Green Mark Incentive Scheme for Existing Buildings provides co-funding for new retrofit works or energy auditing of existing commercial buildings, which must be include GMS certification.
- Green Mark Incentive Scheme Design Prototype provides funding for design workshops and simulation studies for all building projects of 2,000m<sup>2</sup> or more, that aim to achieve a GMS Platinum rating.
- The Energy Efficiency Improvement Assistance Scheme provides co-funding for the manufacturing sector to engage experts to conduct detailed energy audits.
- Tax incentive are also available in the form of accelerated depreciation for energy efficient equipment and technology.

## Financing schemes

The Building Retrofit Energy Efficiency Financing Scheme provides loans for commercial buildings to undertake retrofits through entering into energy performance contracting arrangements.

## Capacity training

Singapore emphasises the role of industry capability in safeguarding the implementation of the GM label and has set a target of training 20,000 professionals, managers, executives and technicians by 2020. To meet this goal it has established a training grant program under the Singapore Certified Manager program, and the Green Mark Design Prototype discussed above, further supports knowledge and expertise in design.

## Summary of best practice policy and regulatory elements

The notable elements of best practice policies drawn from the international policy summaries in this chapter, case studies at Appendix A and broader research are detailed under the headings below.

## Policy packages

Best practice policy package would include a comprehensive mix of complementary measures, such as:

- Target – overarching emissions reduction target with roadmap as to how to achieve.
- Building code – minimum energy performance standards for new and upgraded buildings for all building types.
- Mandatory disclosure – mandatory building labelling/disclosure for all building types and tools to demonstrate building performance.
- High energy performance – high energy performance standards/tools/labelling.
- Incentives – incentives to go beyond minimum energy performance standards utilising high performance standards/tools/labelling, including dedicated programs to induce deep retrofits of existing buildings.
- Energy retailer obligations – schemes designed to incentivise the market for lowest cost upgrades to existing building stock, with energy savings targets mandated by governments, including specified targets for social and low income housing.
- Energy auditing – energy auditing programs (often associated with requirements for mandatory disclosure) with the requirement to be undertaken at intervals of not more than every 3 years. This can be linked to requirement to undertake certain upgrades identified in the audit, where they do not meet minimum requirements of where immediately financially feasible.
- MEPS – minimum energy performance standards and associated labelling for equipment and materials (components of buildings), extending to high energy performance labelling.
- Support for high performance technologies and building practices – designed to establish market for high performance buildings, through market transformation initiatives, and use of demonstration projects/programs.
- Innovating financing mechanisms – established government backed/supported financing programs.

The interaction between complementary policies is a key feature of best practice policy packages:

- Policies are designed in combination to complement, strengthen and streamline.
- Common combinations include building codes, building rating/disclosure, beyond code incentives.
- Supporting tools designed for multiple functions, for example a rating tool that provides an asset rating used to evidence meeting code requirements, can also be used for purposes of mandatory disclosure and beyond code initiatives (e.g. Denmark).
- Targeted market transformation initiatives use a combination of information, incentives and regulation to drive market change. This is done using labels,



information, minimum standards, procurement, grants and rebates (e.g. EU and USA).

#### Individual policies

##### *Targets*

- Ambitious long-term national emissions reduction targets under which sector specific targets are set. International best practice in this regard is the target to achieve net zero emissions by 2050 (or earlier), in line with the Paris Agreement.
- In the absence of ambitious national targets, jurisdictions have set their own targets (e.g. New York City has committed to reduce greenhouse gasses by 80% by 2050 from 2005 levels).
- Targets specific to the contribution of the built environment to meeting the overarching targets and pathways for achieving sector specific contribution developed, broken down further into contributions per policy or sub-sector (e.g. Vancouver roadmap to achieve zero emissions in all new construction by 2030).

##### *Building codes*

- Timelines (e.g. Denmark and Vancouver) or methodology (e.g. EU cost-optimisation) set for future increases to code stringency over time.
- Review cycles set to assess and update code at a maximum of every 3 to 5 years (e.g. US every 3 years, EU every 5 years).
- Use of simple comparable performance metrics, allowing assessment of operational compliance.
- Coverage can extend to require that existing elements of an existing building meet minimum requirements when a renovation triggers the building code (e.g. French requirement to meet minimum insulation levels).
- Include minimum requirements for onsite renewables or solar readiness.

##### *Mandatory disclosure*

- Applicable to all building types (e.g. the EU).
- Triggers disclosure requirement on an ongoing basis (e.g. every 5 years), rather than just points of sale and lease, as not all building types have a high turnover.
- Capability of disclosure tool to rate asset and operational performance (e.g. China).
- Leveraged by other complimentary policies/programs (e.g. Germany)
- Utilisation for data collection, allowing for the measurement, monitoring and reporting on energy performance of building stock as a whole, which can then be used to inform policy development for the built environment more broadly and monitor the impact/effectiveness of policies over time (e.g. the EU).

- Energy retailers obligated to collect and directly provide energy data for the purposes of mandatory disclosure, minimising administrative costs of compliance for property owners (e.g. California, Singapore).

##### *Energy auditing*

- Mandatory auditing and reporting of recommendations for building efficiency improvements under mandatory disclosure programs (e.g. Denmark, New York).
- Can be linked to requirement to undertake certain upgrades identified in an audit, where they do not meet minimum requirements (e.g. Singapore) or where immediately financially feasible (e.g. Denmark).

##### *High energy performance rating tools/labels*

- Tools to rate comparative building performance and acknowledge outstanding achievement (e.g. Passive House, Energy Star).
- Integrated with rating tools required to establish code compliance and mandatory disclosure (e.g. China).
- Integrated with other complimentary policies/programs as a requirement to be eligible for financial incentive schemes (e.g. German KfW CO2-rehabilitation program).

##### *Incentives for high performance*

- Development of high performance code or stretch code federally, for easy reference/uptake by state and local governments.
- This can either be incentivised through targeted programs (for example utility, subsidies/grants or tax incentives) or adopted as mandatory by progressive jurisdictions (see the Massachusetts case study).
- Furthermore the stretch code can be aligned with future updates to the building code, and integration of mandatory disclosure ratings into the code and planning approval process, allowing buildings to be certified to future codes (see the Denmark case study).
- Dedicated initiatives to induce deep retrofits of existing building stock, drawing of high performance rating tools and programs above (e.g. Energiesprong Netherlands).
- Dedicated market transformation programs (e.g. US, EU).
- Tax incentive programs used widely internationally.

##### *Energy retailer obligations*

- Energy retailer obligation schemes utilised very broadly internationally.
- Mandated targets set at a central level (e.g. EU).
- Specific targets set for energy savings to be achieved in low income and social housing sectors (e.g. UK).
- Established as a white certificate scheme utilising tradable certificates (e.g. US, UK, EU).

- Linked to trading schemes targeting other sectors of the economy (such as utilities) or carbon pricing schemes more generally.
- Allowing utility involvement in code support to count towards energy savings targets (e.g. US).

#### *MEPS and labelling*

- MEPS set for broad range of products, equipment, building materials, and systems.
- Methodology set for future increases to stringency over time (e.g. Top Runner programs China and Japan).
- Extended to include high energy performance labelling (e.g. Energy Star in the US).
- HEPS can then be leveraged by complementary programs/policies.

#### *Support for high performance technologies and practices*

- Dedicated research institutions financed by federal governments but sufficiently independent to ensure stability and provision of independent expert analysis (e.g. Pacific NorthWest and Lawrence Berkley National Laboratories in the US, the Joint Research Centre for the EU).
- Demonstration projects and program trials used widely internationally to test and demonstrate best practice and to test market capability to meet future requirements (e.g. Singapore and Netherlands).
- Government sponsored competitions and award programs to incentivise development of high performing technologies (e.g. Japan, Singapore).

#### *Innovative financing mechanisms*

- Central provision of framework, guidance regarding development and implementation, and user information more generally (e.g. Department of Energy in the US).
- On bill financing, where upfront costs of energy efficiency upgrades are paid off over time through a property's electricity bill, where amount repaid does not exceed electricity savings achieved due to upgrades, hence being negative or neutral cost. The two models allow either the energy retailer or other 3<sup>rd</sup> party to incur the initial cost of the upgrade. Can be utilised through retailer obligation schemes.
- Property-assessed financing, which allows loans for efficiency upgrades to be attached to the title itself, and paid off over a long timeframe (up to 20 years) through land tax payments. Being attached to the property the loan is thereby passed on with future property sales.
- Energy efficient mortgages, where low ongoing operation costs of a property are taken into account.
- Public-private partnerships that encourage investment in energy performance of buildings, and supporting investor recognition of high performing buildings as an investment asset class (e.g. German KfW program).

## 5. The Policy Landscape in Australia

This chapter reviews major policy instruments used in Australia to influence carbon and energy outcomes in the built environment. It begins with national policies – many of which are managed jointly between the Australian and state and territory governments – and then covers state and territory measures and local government measures. It does not aim to be a complete description, but rather to focus on major measures and to draw out salient features of policy designs, and compare them where appropriate to international practices.

### National Policies

The key national building energy efficiency and carbon abatement policies include:

- Building energy performance standards in the National Construction Code
- National Australian Built Environment Rating System (NABERS)
- Commercial Building Disclosure (CBD)
- National House Energy Rating Scheme (NatHERS)
- Minimum energy performance standards/labelling for certain building products.

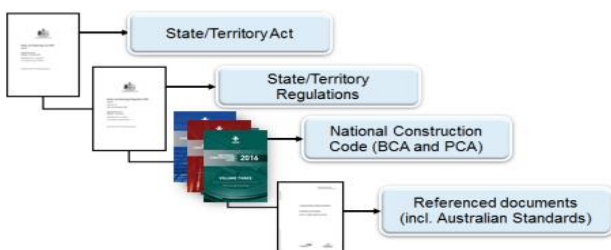
We also cover the industry Green Star voluntary rating and certification scheme, the National Energy Productivity Plan, the Clean Energy Finance Corporation, the Emissions Reduction Fund and the Carbon Neutral Program. We note that, as the name suggests, the NEPP is a plan rather than a set of policies. However, if implemented with ambition, the Plan could impact significantly on building policies *inter alia*.

#### National Construction Code

The National Construction Code (NCC, or the Code) is effectively a model code, developed under the joint oversight of the states and territories, local government and the Australian Government through the Building Ministers Forum and the Council of Australian Governments. The NCC (which represents a merged Building Code of Australia (BCA) – Volumes 1 and 2 of the NCC; and Plumbing Code of Australia (PCA) – Volume 3 of the NCC) is called up and given legal effect through separate legislation and regulations in each state and territory.

**Figure 5: National Construction Code Regulatory Framework**

Source: <http://www.abcb.gov.au/NCC/Regulatory-Framework>



### Governance arrangements

The Code administration and development is overseen by the Australian Building Codes Board (ABCB or the Board), which describes itself as a standards-writing body. The ABCB was created by an Inter-Governmental Agreement (IGA), first agreed in 1994 and last updated in 2012.<sup>115</sup> It is comprised of between ten and sixteen members including a Chair, representatives of each state and territory and of local government, and five industry representatives.

The IGA – which, as Clause 23 clearly states, is not legally binding – specifies that the role of the ABCB is to “...address the following issues in the design, construction and performance of buildings which are listed in order of priority: a) safety and health; b) amenity and sustainability”.<sup>116</sup>

It may be noted that the IGA differs from the National Construction Code in assigning a lower priority to sustainability (and amenity) issues. The goal of the Code itself is “...to enable the achievement of nationally consistent, minimum necessary standards of relevant safety (including structural safety and safety from fire), health, amenity and sustainability objectives efficiently”.<sup>117</sup> There is no mention of sustainability or amenity goals having a lower priority than other goals.

It may also be noted that the IGA specifically asks the ABCB to address issues relating to the *performance* of buildings, including the sustainability performance of buildings.

We also note that the parties to the IGA (that provides for the existence and operations of the ABCB) includes the Australian Government and State and Territories, but excludes local government, although local government is represented on the ABCB and on COAG.

The IGA (Clause 5) lists the objectives of the Board as being to:

- develop codes and standards that accord with strategic priorities established by Ministers from time to time, having regard to societal needs and expectations;
- establish codes and standards that are the minimum necessary to efficiently achieve the relevant Mission of ensuring safety and health, and amenity and Sustainability objectives [emphasis added];

<sup>115</sup> ABCB, An Agreement between the Governments of the Commonwealth of Australia, the States and the Territories to continue in existence and provide for the operation of the Australian Building Codes Board, 2012, available from: <http://www.abcb.gov.au/Resources/Publications/Corporate/Inter-Governmental-Agreement>, viewed 15/1/2017.

<sup>116</sup> Ibid, p. 7.

<sup>117</sup> ABCB, *National Construction Code Series 2015 Volume 1*, 2015, p. 8.

- ensure that, in determining the area of regulation and the level of the requirements:
  - there is a rigorously tested rationale for the regulation;
  - the regulations are effective and proportional to the issues being addressed such that the regulation will generate benefits to society greater than the costs (that is, net benefits);
  - there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits; and
  - the competitive effects of the regulation have been considered; and the regulation is no more restrictive than necessary in the public interest.
- ensure that NCC requirements are:
  - performance-based;
  - verifiable;
  - based on appropriate international standards; and
  - expressed in plain English;
- ensure that NCC requirements are as far as practicable consistent across the States and the Territories;
- encourage reduced reliance on regulation by providing a forum to explore alternative mechanisms for delivering outcomes;
- raise awareness of, and provide information to industry and relevant stakeholders on, the development of the NCC;
- manage or oversee the management of product certification schemes relating to building and plumbing which assist the Board with achieving its other objectives listed above.

A Building Ministers Forum (BMF) effectively provides oversight to the ABCB, and it comprises Commonwealth, State and Territory Ministers responsible for building and plumbing regulation. Local government is not represented on the BMF, although it is on the Board and in COAG. The Australian Government Department of Finance notes “The role of the BMF is to meet periodically to review the outcomes and progress of the ABCB.” Secretariat support for the BMF is provided by the Australian Government (Department of Industry and Science).<sup>118</sup> The BMF itself is not a formal body under COAG.

Perhaps because of this, in practice the BMF has not played a leading role in the development of sustainability objectives or energy performance requirements within the Code. Generally, the leadership that has been evidenced at times in the past has come from COAG (Energy Council and predecessors), mostly under the influence of Commonwealth – and specifically environmental/climate change – officials. It should be noted that, in most jurisdictions, building ministers are not energy ministers and therefore they do not sit on the COAG Energy Council. Practically it has been the

energy/environment/climate change ministers – who have at times sat on this COAG Council – who have in the past been the drivers of new energy performance requirements in the Code: building ministers have been at best passive in this process. However, depending upon the Administrative Arrangements Orders applying from time to time, there has often been three Commonwealth portfolios with (competing) interests in the energy performance of buildings – industry, energy and environment – with a lack of clarity with respect to leadership. At present, energy and environment interests fall within the one portfolio (the Department of the Environment & Energy), but industry (including oversight of the ABCB) is in another portfolio (the Department of Industry, Innovation and Science).

### Assessment

Overall, it is hard not to conclude that governance structures for the National Construction Code, and its energy performance requirements in particular, are complex, overlapping and, in some cases, poorly defined.

Many stakeholders in the building industry believe that these structures have not provided effective or necessary leadership to improve the energy and greenhouse performance of buildings in Australia.<sup>119</sup> The NEEBP project cited involved engaging with over 1000 building industry stakeholders in every state and territory in Australia, in cities and regional and remote areas, and revealed a surprising depth and breadth of cynicism about the regulatory framework for the energy performance of buildings in Australia. The head of a major building industry association, for example, stated in this context that: “You need to understand: we don’t have a system of regulating the energy performance of buildings in Australia; we have a system to make it *look like* we are regulating the energy performance of buildings”.<sup>120</sup> Another building official, referring to poor enforcement of and compliance with the Code’s energy performance requirements in Australia, stated in a stakeholder forum that “No-one cares and no-one’s looking”.<sup>121</sup>

To be fair to those involved in the regulatory system, it is clear that the framework and context in which they are operating is one where the role of regulation is being minimised and where, as noted, objectives are unclear. In the NEEBP project cited above, many building regulators indicated that they were not and never had been resourced to implement the energy performance requirements in the Code, or indeed to enforce them. Several evinced genuine antipathy towards the sustainability requirements and noted they were the least of their priorities – which may explain the

<sup>118</sup> <https://www.finance.gov.au/resource-management/governance/register/body/105411/>, viewed 15/1/2017.

<sup>119</sup> pitt&sherry/Swinburne University of Technology, *National Energy Efficient Buildings Project: Stage 1 Report*, December 2014.

<sup>120</sup> Personal communication.

<sup>121</sup> NEEBP, cited above (ref. 20).

origins of the statement to this effect in the IGA, as noted above.

Structurally, there is a clear disconnect in the overall governance of the Code resting with building ministers who are not represented at COAG and not responsible for energy or climate change policy. Administratively there is a similar disconnect with officials responsible for implementing, including enforcing, the Code being divorced from energy or environmental officials in their respective jurisdictions – to varying degrees, depending upon the jurisdiction.

It is hard not to conclude that the system described above is aiming to achieve low (minimum necessary) standards of energy performance in Australian buildings, and that it is likely to be succeeding in this aim – although the absence of systematic compliance auditing in any jurisdiction makes it hard to know to what extent it is succeeding.

### *Sustainability objectives*

The nature of sustainability objectives referred to in Clause 5 of the IGA and in the Code itself is not explicitly stated in either document. The Code notes that the goal of the BCA (noted above) is:

“...applied so that—

- (a) there is a rigorously tested rationale for the regulation; and
- (b) the regulation is effective and proportional to the issues being addressed such that the regulation will generate benefits to society greater than the costs (that is, net benefits); and
- (c) there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits; and
- (d) the competitive effects of the regulation have been considered and the regulation is no more restrictive than necessary in the public interest.”

This clause essentially applies tests from regulation impact assessment to the Code, but does not illuminate the nature of the sustainability (or other) objectives. The Code does clearly state (Section A0.6) that the objectives (and functional statements) are to be used for guidance and as an aid to interpretation only, while the functional requirement of the Code is that buildings must comply with the Code’s performance requirements, either by complying with deemed-to-satisfy (DTS) provisions or by formulating an alternative solution that complies with the performance requirements or is shown to be at least equivalent to the DTS provisions.<sup>122</sup>

The performance requirements themselves are set out by Section J. Section J is entitled Energy Efficiency, but the (non-binding) objective of this Section is “...to reduce greenhouse

gas emissions”. This represents the only apparent sustainability objective in the Code. The (non-binding) functional statement (JF1) then effectively qualifies this objective by adding “To reduce greenhouse gas emissions to the extent necessary” [emphasis added]. The (binding) performance requirements are JP1: “A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy...”; and JP3, which specifies that heating for a conditioned space “...must, to the degree necessary, obtain energy from low-carbon or renewable energy sources” [emphasis added].<sup>123</sup>

The emphasised text above – from the IGA and Code – regarding ‘minimum necessary’ and ‘to the extent necessary’ has a reasonably intuitive meaning in the context of safety, health and amenity. It accords with Clause 5 of the IGA which calls for regulations to be ‘proportional to the issues being addressed’ – that is, to make building regulations the least burdensome as possible while still being effective. For example, while standards and performance requirements must be sufficient to ensure structural integrity, requiring steel beams to be capable of bearing ten times their actual load would be seen as not proportional to the issue being addressed. Similarly, if fire stairs of a certain size and location are deemed necessary for fire safety, adding three or four times as many stairs might not be seen as proportional. If a certain volume of fresh air is required for occupant amenity, providing five times that amount of air would not multiply their amenity by five times.

But what of sustainability? What is the ‘necessary extent’ of sustainability? To answer such a question the sustainability goals or objectives of the Code would need to be spelled out but, as noted, they are not. By implication, the primary goal is to reduce greenhouse gas emissions (to the extent necessary), but to what extent, precisely? As noted in Chapter 2, the goal of the Paris Climate Agreement, to which Australia is a signatory, is effectively – albeit not explicitly – to reach net zero emissions by the second half of this Century. Also, if we accept that Australia’s carbon budget is being exhausted at a faster rate than that of most other countries, due to our higher per-capita emissions, and noting that buildings built today will, on average, still be standing in 2050, then the ‘necessary extent’ for greenhouse gas abatement is very rapidly indeed. The minimum requirement implied by this test is net zero emissions by the second half of the Century, but potentially by as little as 15 years away if we are to keep within our global carbon budget, as noted in Chapter 2.

This logical reading of the IGA and Code, however, does not at all accord with the aspirations of policy makers in Australia. The phrases ‘minimum necessary’ and ‘to the extent necessary’ are applied in a manner that seeks to minimise the stringency, and indeed use, of regulation. As noted above, the Board is required to encourage reduced reliance on regulation and to apply rigorous regulatory tests prior to

<sup>122</sup> Ibid, p. 14.

<sup>123</sup> Ibid, pp. 386 – 387.



proposing requirements, while the states, territories and local governments are implored to achieve uniformity with this ‘minimum necessary’ approach and not to set higher standards. The IGA notes (Clause C part vi., p. 2) that:

*“...the respective governments of the Commonwealth, the States and the Territories commit to: vi) seeking commitments from their local governments and other local government-like bodies where they have any administrative responsibility for regulating the building and plumbing industry, and as far as practicable implementing a ‘gateway’ model which prevents local governments and other local government-like bodies from setting prescriptive standards for buildings that override performance requirements in the NCC [emphasis added].*

This approach contrasts starkly with those seen in Europe and the United States, where model Codes are stated as being the minimum necessary, while individual states/countries (in Europe) are encouraged to set higher standards. The Energy Performance Directive for Buildings, for example, states (Clause 10) that building performance requirements:

*should be set with a view to achieving the cost-optimal balance between the investments involved and the energy costs saved throughout the lifecycle of the building, without prejudice to the right of Member States to set minimum requirements which are more energy efficient than cost-optimal energy efficiency levels.*

In practice, the intent of the IGA and ABCB appears to be to set standards for energy performance regulation that are both the minimum necessary (as defined by the decision makers) *and the maximum allowed*. We note that this same approach is not taken for amenity, safety and health. One might ask why more of these outcomes is considered desirable, and is certainly is not constrained by the regulatory framework, while more sustainability or greenhouse gas abatement is considered undesirable and an Inter-Governmental Agreement signed in part to try to prevent these outcomes being achieved.

As is discussed in Sections 4.2 and 4.3, this regulatory intent to limit above-minimum would appear to be increasingly failing, as individual Councils arguably take greater note than does the ABCB or COAG of the Board objective (5.1 a.) to “develop codes and standards...having regard to societal needs and expectations” by setting above-Code-minimum requirements via planning schemes.<sup>124</sup>

### Stringency

Making comparisons of the stringency of building energy performance standards, particularly internationally, is

difficult, primarily because of climate differences but also because different approaches and metrics are used to set requirements and assess degrees of compliance. To building experts from Europe, for example, many of our energy performance standards (for aspects such as thermal insulation, u-values of structures, glazing standards, and the absence of airtightness requirements) appear lax, but our milder climate means that European standards may not be justified in Australia. After climate, factors such as differences in building materials; building product/component availability, price and quality; design preferences and construction practices; are all commonly cited as barriers to making direct comparisons. There is, however, a ‘chicken and egg’ element to this argument – if standards were higher, that would justify local manufacturers and suppliers of overseas product to make available higher performing products in greater volumes and at lower prices; and if these elements were available at lower prices, higher standards would be justified on economic grounds.

We noted earlier that the Code itself offers no guidance on how stringent standards should be, in any performance domain, beyond the phrase ‘minimum necessary’. This may be contrasted with the European approach, where standards are required to be ‘cost optimal’, as noted above, a phrase which is defined with reference to detailed and specific guidelines – documented as Commission Delegated Regulation (CDR) 244/2012.

The IGA notes that Codes are to ‘accord with strategic priorities established by Ministers from time to time’ (Clause 5), clearly signalling that the process of setting building standards in Australia is a political one. It also applies a set of regulatory tests that set a high ‘hurdle rate’ for any regulatory proposals, including that:

- there is a rigorously tested rationale for the regulation
- the regulations are effective and proportional to the issues being addressed such that the regulation will generate benefits to society greater than the costs (that is, net benefits);
- there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits; and
- the competitive effects of the regulation have been considered; and the regulation is no more restrictive than necessary in the public interest.

Each of these tests is reasonable. However, in practice the regulatory impact assessment process is widely understood to be a form of ‘gate-keeping’, designed primarily to minimise new regulation. In practice, by making it difficult and slow to change stringency, its operation is to enshrine the status quo. However, the same tests are not applied to the status quo. That is, we do not ask whether the current energy performance requirements for buildings is delivering on the Code’s sustainability and greenhouse abatement objectives, and to the extent necessary. We do not ask whether current stringencies are ‘proportional to the issue being addressed’ – climate change – and take action if they are not.

<sup>124</sup> IGA, p. 8.

Also, while the IGA specifies Code requirements are to be ‘as far as practicable consistent across the States and the Territories’, in practice there are wide variations, as discussed in section 4.2 below, and none of these variations are required to meet the same regulatory tests that apply to the model code. We do not require of NSW that it demonstrates that BASIX embodies equivalent energy performance standards to the NCC, for example, and the Northern Territory is not asked to demonstrate that its 5 star standards for housing optimise net social welfare in that Territory’s tropical climate.

In principle, the IGA sets out a process for determining the stringency of energy performance requirements. It specifies, as noted above, that standards should ‘generate benefits to society greater than the costs’ and ‘there is no regulatory or non-regulatory alternative...that would generate higher net benefits’. This implies an economic test whereby a range of options is considered and the option with the highest net present value (surplus of social benefits over costs) is selected. Provided all relevant social costs and benefits including externalities, along with changing boundary conditions such as a changing climate, are appropriately considered and valued, then such a process should yield optimal results.

In practice, however, there are many methodological but also process and governance questions that will impact on the quality of the results. These include how often this test is applied – noting that the last time it was applied in Australia was in 2009, leading to stringency changes in BCA2010, while a process is underway to determine whether or not there should be a next stringency change in BCA2019 – fully nine years later – and then only for commercial buildings, despite *prima facie* evidence that a significant lift in stringency change for residential buildings would also be economically justified.<sup>125</sup> If indeed residential energy performance standards are not changed until the next three-year regulatory window (another process construct that may prevent optimal standards being adopted in a timely and socially-optimal manner) in 2022, this 12-year reign of standards set in 2009 – despite retail energy prices almost doubling over this period<sup>126</sup> – would be an almost unique record amongst developed countries.<sup>127</sup>

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<sup>125</sup> pitt&sherry, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards: benefit cost analysis: 2016 update for residential buildings*, 2016, published by the Department of the Environment & Energy and available from <http://www.nathers.gov.au/sites/prod.nathers/files/u20/Pathways%20update%20report%20-%20final.pdf> viewed 16 January 2017.

<sup>126</sup> <https://www.energycouncil.com.au/analysis/worldwide-electricity-prices-how-does-australia-compare/>, viewed 4 February 2017.

<sup>127</sup> Some US States have no State-based energy performance codes at all, but may have local codes: see

We note that these outcomes have been achieved despite the National Strategy on Energy Efficiency promising (p. 22):

*...major reforms to the building standard setting and rating system in 2011 to deliver national consistency in the way minimum standards for building energy efficiency are set and how performance outcomes and design are assessed and rated. Governments will set out a clear process and timetable for periodic review (for example, every three years starting in 2012) of energy efficiency standards so that over the life of this strategy energy efficiency requirements will be progressively increased. This will give industry greater confidence to innovate and develop affordable solutions to improve building energy efficiency. For example, six, seven and eight star buildings, or equivalent, will become the norm in Australia, not the exception. [emphasis added]*

Methodological issues that affect the quality of outcomes achieved under the National Construction Code are perhaps beyond the scope of this project to fully document, but they include the choice of discount rate, the extent to which evidence about declining incremental costs of compliance (‘learning rates’) is applied and, more generally, the extent to which public policy research is undertaken to support optimal decision making in this field, the budgets and timelines made available for such research, and the extent which such decisions adequately anticipate regulatory cycles, enabling decision makers to be presented with the required evidence in the required timeframes.

What we can say with confidence is that the available evidence indicates that the stringency of building energy performance standards in Australia is low, using an economic analysis framework as required by the IGA. The previous reference concluded, for residential buildings, that:<sup>128</sup>

*...there are significant cost effective opportunities for energy savings in new residential buildings in 2020, relative to BCA2010, ranging from 8% to 49% across Australia, depending on assumptions made about industry learning rates and possible future carbon prices (see Table 1). This equates to star ratings potentially up to 8 star for Class 1 dwellings and up to 9 star for Class 2 dwellings, depending on the state/territory.*

This is exactly equivalent as saying the current standards are 8% to 49% too low from an economic perspective.

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<https://www.energycodes.gov/status-state-energy-code-adoption>, viewed 4 February 2017.

<sup>128</sup> pitt&sherry, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards: benefit cost analysis: 2016 update for residential buildings*, 2016, p. 1.

The counterpart study for commercial buildings concluded:<sup>129</sup>

*...even if no learning is assumed, average savings of 35% are cost effective with a low shadow carbon price and a BCR of 1. With a higher shadow carbon price and a target BCR of 1, savings of 47% on average are cost effective, even with no learning. If learning is set at 100% over 7 years, then savings of between 50% and up to 80% are shown to be cost-effective, depending upon the scenario selected. At the other end of the spectrum, if a target BCR of 1.5 is specified and no learning, then savings (of 14%) are cost effective only with the 'medium' carbon price assumption, and none at all with lower carbon price assumptions.*

That is, standards for commercial buildings are up to 80% too low from an economic perspective.

We note that both of these studies were limited-scope updates on detailed work undertaken in 2011 – a point that we would cross-reference with the one above noting that, on the current process for standards development, much rests on the budgets available to, and the discretion exercised by, government agencies to commission timely and sufficient research to demonstrate whether or not the IGA criteria would be met via a stringency increase. If the question is not asked, regulatory settings remain unchanged, regardless of what the answer to the question would be.

Nevertheless the above references establish a *prima facie* case, justified using the economic criteria applied by the ABCB, for significant uplifts in the stringency of energy performance requirements for all building classes in Australia. This should be sufficient basis to proceed with full regulatory impact assessment – see Section 4.4 below.

While the RIS process focuses on regulatory costs, another concept in economics is opportunity cost. Opportunity cost is the foregone benefit of failing to seize an opportunity that would have generated net economic welfare. A study by ClimateWorks has calculated that:<sup>130</sup>

*Just five years of delay in implementing the opportunities in buildings could led to \$24 billion in wasted energy costs and over 170 Mt of lost emission reduction opportunities.*

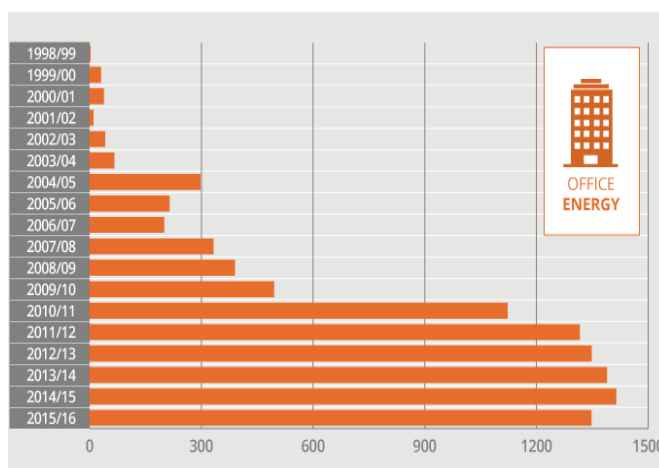
<sup>129</sup> pitt&sherry, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards: benefit cost analysis: commercial buildings: 2016 update*, May 2016, published by the Department of Industry, Innovation and Science and available from <https://industry.gov.au/Energy/EnergyEfficiency/Non-residentialBuildings/Documents/Pathway-to-2020-for-Increased-Stringency-in-New-Building-Energy-Efficiency-Standards-2016-Update.pdf> viewed 16 January 2017.

<sup>130</sup> ClimateWorks, *Low Carbon, High Performance: how buildings can make a major contribution to Australia's emissions and productivity goals: summary report*, May 2016, p. 15.

The same report notes that a further five years of delay (to 2025) would see these figures increase to \$43 billion in wasted energy costs and 397 Mt of unnecessary greenhouse gas emissions. The actual opportunity costs imposed on the Australian economy by a succession of Governments failing to increase energy performance requirements over the 2010 to 2019 or 2022 period has not been calculated.

For readers interested in a more detailed analysis of issues surrounding the National Construction Code, we note that the Phase 1 Report of the *National Energy Efficient Buildings Project*, referenced above, provides a more detailed treatment of this topic.

#### NABERS



**Figure 6: Total NABERS Office Energy Ratings by Year**

Source: NABERS Annual Report 2015-16

NABERS was developed as a voluntary rating scheme for offices, initially, based on the actual operational performance of the building, including a minimum of 12 months of measured performance information. It is a national scheme, administered by NSW (Office of Environment & Heritage).

The program was originally launched as the Australian Building Greenhouse Rating (ABGR) system in 1999 and has evolved considerably over time.<sup>131</sup>

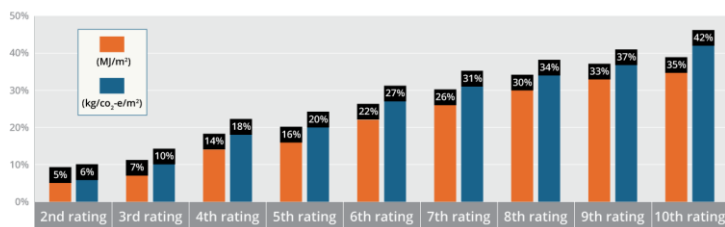
The 'as built' nature of the NABERS rating differs from the National House Energy Rating Scheme (NatHERS) for residential buildings, which is based on modelled thermal performance, 'as designed', with no after-the-fact or as-built verification. This as-built aspect also distinguishes NABERS from many overseas schemes, notably including the EPBD scheme in Europe, and may be considered a 'best practice' aspect of the scheme.

<sup>131</sup> See, for example, NABERS, *The Key Principles and Defining Features of NABERS, Version 1.0*, September 2014.

NABERS tools now exist for hotels, shopping centres (base buildings only) and data centres, including water as well as energy ratings for shopping centres and offices, and also indoor environment and waste tools for offices. Program statistics note that over individual 2700 offices have received energy ratings at least once over the life of the program; 1103 office water ratings; and smaller numbers of ratings of other building types (e.g., 196 shopping centre energy ratings).<sup>132</sup>

As discussed below, since 2011 NABERS has been used as the calculation engine for the Commercial Building Disclosure scheme. This has seen a significant increase in the penetration of the rating tool in the office segment – with 82% of all offices in Australia now having been rated for energy at least once under NABERS. The mandatory nature of CBD has also changed the distribution and measured impact of NABERS, with many lower-rated buildings entering the scheme in the years after 2011, which would never have been rated voluntarily – a strong demonstration of how the mandatory nature of CBD has overcome adverse selection, evident even in the presence of a voluntary disclosure scheme, in at least the part of the offices market that CBD covers. The increase in ratings from 2011 is evident in Figure 6 below.

The distribution of ratings – including the increase in zero rated buildings in 2011 – is shown in Figure 7.



**Figure 7: Distribution of NABERS Office Energy Ratings (Base and Whole Buildings, without GreenPower) by Star Band and Year**

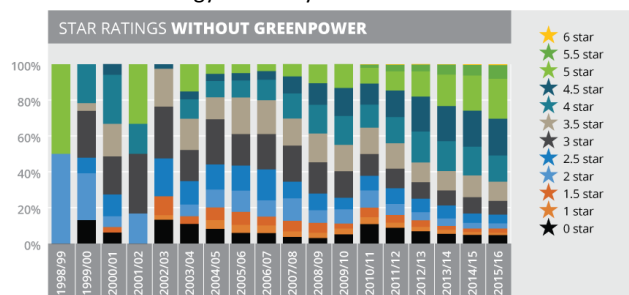
Source: NABERS, Annual Report 2015-16

### Assessment

The headline impact of the scheme, as generally cited, is impressive. As shown in **Error! Not a valid bookmark self-reference.**, offices (base and whole buildings) rated 10 times (e.g., due to the annual/continuous disclosure preference in the institutional/property trusts segment of the office market) have achieved measured energy savings of 35% and emissions savings of 42%. There is also a progression in

<sup>132</sup> NABERS, Annual Report 2015-16, available from <https://nabers.gov.au/AnnualReport/2015-2016/index.html>, viewed 17 January 2017.

savings over time, which could indicate a learning effect – as more information is provided to building owners, about their performance relative to others, but also about savings options – they respond progressively and increase their investment in energy efficiency.



**Figure 8: NABERS Office Energy and Emissions Savings (Base and Whole Buildings, without Green Power) by Rating Number**

Source: NABERS, Annual Report 2015-16

However, it is important to understand that the as-built nature of NABERS ratings also means that *all* changes in performance are captured, regardless of causality or attribution. The measured results therefore include business-as-usual changes that would have occurred in any case; those attributable to state schemes such as white certificate schemes; those attributable to state and federal government procurement policies; those attributable to Green Star; and those attributable to other national policies, such as the application of Code energy performance requirements to office renovations and upgrades, and minimum energy performance standards applying to building products such as chillers, pumps, fans and lamps. NABERS upgrades of at least 1 star are also eligible for assistance under the Australian Government’s Emissions Reduction Fund, as well as the NSW Government’s Energy Savings Scheme. It would be a very difficult, but informative, task to attempt to separate the attribution of savings in the office market across the different influences noted, but this work does not appear to have been done.

In the absence of such analysis – and particularly following the introduction of the mandatory CBD scheme – it is not possible to say what the independent contribution to measured savings is attributable solely to the voluntary ratings core of the original NABERS scheme. That said, there are other success indicators, including a growing demand for NABERS in other countries, including New Zealand and Hong Kong. Also, NABERS has a synergistic relationship with schemes like CitySwitch (which aims to increase the eco-efficiency of office tenants, including by encouraging tenants to undertake NABERS tenancy ratings), and could be identified as a critical enabler of savings attributed to related schemes, including Green Star, CBD and procurement policies at least.

Overall, NABERS is rightly regarded as a significant success story. Apart from the headline results, other strengths of the



program arguably include its extensive engagement with industry – in governance and consultation arrangements – which program managers view as critical to its credibility with and use by the office sector in particular. The program also has extensive arrangements in place for training, accreditation and auditing of assessors, which should be noted as best practice, including by contrast with the residential NatHERS scheme.

That said, key limitations of NABERS include its limited coverage of building types and energy end-uses, and its limited impact in purely voluntary segments (excluding offices). Decisions about the development of new ratings tools are made via the programs governance arrangements, which included a two-tiered structure of a National Steering Committee comprising commonwealth, state and territory buildings officials; and a Stakeholder Advisory Committee comprising primarily building industry representatives. The program notes as a key feature that it is administered independently of industry.<sup>133</sup> While some stakeholders have expressed the view that the influence of industry on the program's governance is excessive, steps have been taken over time to increase the separation between these two bodies.

An aspect of the voluntary nature and industry focus of the program is reflected in another of its key principles, which is that NABERS ratings should be implemented in 'suitable markets'. The suitability test applied includes the level of maturity of the market (e.g., is there sufficient awareness of sustainability issues to indicate reasonable take-up of a voluntary tool – if not, the Key Principles document correctly notes that mandatory measures may be more effective. Also, building performance must be 'relevant for third parties' (e.g., tenants, investors, public). The suitable markets test also includes a requirement for market competition and a sufficient pool of buildings. These requirements accord with the voluntary nature of the scheme, where the trigger is linked to a particular action, such as a sale or lease. However, these requirements also act to limit the coverage of the scheme. In an energy efficient economy, with active energy service providers, the performance of almost every building is of interest – regardless of whether it is in a competitive market segment or not. The primary barrier to buildings being upgraded is if information about their energy performance is not available to potential service providers. Finally, practical barriers to expanding the coverage of NABERS have included budget constraints – NABERS is essentially fully cost recovered, and program managers and, even more so, industry stakeholders are wary of taking any action that might lead to price increases – and an industry view that 'consolidation' is preferable to expansion.<sup>134</sup>

From an analytical and statistical perspective, there are also limitations in the information collected and published by the program, including non-collection of data on the age of

buildings and plant, and the date of last refurbishment, which – if available – would significantly enhance opportunities for targeting of energy service provision as well as policy analysis. Overall, the criticisms of NABERS are relatively mild, and it is widely regarded as one of the best aspects of Australia's building energy efficiency framework. Given this, it would be highly desirable if governance and funding arrangements – and the ambition of policy makers – were such that the scheme could be expanded, as noted above, to fully realise its potential.

#### Commercial Building Disclosure

Another key piece of policy and regulation administered by the Australian Governments is the *Commercial Building Disclosure* (CBD) scheme. CBD emerged from the 2009 National Strategy on Energy Efficiency, or NSEE, which noted (p. 22):

*...people seeking to buy or lease properties will be provided with information about the energy efficiency of the buildings through proposed new mandatory disclosure provisions. Armed with this information, consumers and businesses will be able to make informed choices about the energy efficiency of the buildings they buy and lease – and builders and building owners will respond to those market signals by investing in energy efficiency.*

The legislation, which took full effect from November 2011, essentially requires:<sup>135</sup>

*...most sellers and lessors of large office spaces to provide energy efficiency information to prospective buyers and tenants. Disclosure of energy efficiency information is mandatory for commercial office spaces of 2,000 square metres or more. NABERS star ratings must also be included in advertisements for sale or lease.*

*Owners of disclosure-affected buildings are required to obtain a Building Energy Efficiency Certificate (BEEC) that comprises:*

- *a NABERS Energy star rating for the building*
  - *an assessment of the energy efficiency of tenancy lighting in the area of the building that is being sold or leased (a Tenancy Lighting Assessment or TLA)*
  - *general energy efficiency guidance.*
- BEECs are valid for up to 12 months and are disclosed publicly online.*

#### Assessment

The 2015 review of CBD found that by 2014 it had already delivered net benefits valued at \$44 million, without

<sup>133</sup> NABERS (2014), p. 23.

<sup>134</sup> Ibid, p. 19.

<sup>135</sup> ACIL Allen, *Commercial Building Disclosure Program Review: Final Report*, March 2015, p. 1.



including an estimated \$168 million in net benefits associated with higher labour productivity. It had also delivered over 2 Mt of greenhouse gas abatement, implying a negative cost of abatement of -\$21.45/t CO<sub>2</sub>-e over that period. The report estimated that by continuing the program to 2017 and expanding its scope to include offices above 1000 sqm, the present value of net benefits would rise to some \$112 million, with cumulative reductions of 3.8 Mt CO<sub>2</sub>-e (over -\$29 t/CO<sub>2</sub>-e), and potentially higher again with improvements to the Tenant Lighting Assessment component of the scheme.

The success of CBD in reality accords well with the anticipated performance, from an in-principle perspective, of mandatory disclosure in the 2007 Garnaut Climate Change Review. This major review of climate change and mitigation/adaptation strategies – by a well-regarded economist and from a strictly economic perspective – indicated (p. 412) that:

*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. [emphasis added]*

The terms of reference for the 2015 Review included a request for recommendations “...about the merits of continuing the program or not, both in terms of the public interest as well as the private interests of property owners and tenants”.<sup>136</sup> This is notable in two respects: first, its presumption that there may not be merits in continuing the program; and second, the specification of a private interests tests for one group in society (property owners and tenants) in addition to the social benefit cost analysis applied through regulatory impact assessment. Despite this, the Review in fact recommended continuation and indeed expansion of the scope of the program, specifically by reducing the minimum size of office space to which the measure applies from 2,000 to 1,000 sqm.

CBD – which is given effect via its own legislation and regulations – is clearly a successful policy. That said, it has many limitations which represent significant opportunity costs and gaps in Australia’s buildings policy framework.

First, program only applies to offices above a size threshold (moving to 1000 sqm), and then subject to further limitations – such the building having to have 75% office space before the measure applies, regards of other criteria including the 1,000 sqm individual tenancy threshold. Offices are an important building class, representing some 27% of the total

<sup>136</sup> ACIL Allen (2015), p. 2.

commercial building stock, but this leaves three quarters of this stock (plus offices below 1000 sqm) out of the scheme.<sup>137</sup>

A counterpart measure in the National Strategy on Energy Efficiency – mandatory disclosure of residential building energy, greenhouse and water performance – that was to have commenced in May 2011 – is yet to commence more than seven years after it was announced. The development of this measure progressed as far as Consultation RIS, published in July 2011, including stakeholder and public submissions, many of which were strongly supportive. There appears to be no statement on the public record as to why the development of the measure ceased. Informally, stakeholders suggest that governments were unable to reach agreement about key program parameters, while the absence of an existing rating tool that measured energy, greenhouse and water efficiency also represented a barrier. All but one of the implementation options in the Consultation RIS were found to be cost effective, with the preferred option (Option 2: mandatory disclosure of residential building energy, greenhouse and water performance information at the point of advertising for sales and leases through an assessor based assessment with a simplified thermal simulation) expected to realise a net economic benefit of almost \$1 billion over ten years. Net benefits were not evidenced for South Australia, Western Australia and the Northern Territory on this option (although they were for other options), and this may also help to explain why the measure did not proceed.

We note that the CRC LCL has since undertaken a very detailed research project, known as EnergyFit Homes,<sup>138</sup> which examines the business case for a national voluntary disclosure scheme for residential buildings. This project has confirmed not only that there would be clear economic and environmental benefits from such a scheme – up to \$535 million in net economic benefits and over 1,800 GWh of electricity savings – but also that consumers and many industry professionals would value it highly. The report also offers highly researched and detailed insights into the optimal design and delivery model for such a scheme. As discussed in Section 5.2, Victoria is developing a similar scheme.

The original 2008 Regulation Document for CBD noted:<sup>139</sup>

*While the scheme will initially only impose obligations with respect to Class 5 buildings, the*

<sup>137</sup> COAG/NSEE, *Baseline Energy Consumption and Greenhouse Gas Emissions in Commercial Buildings in Australia Part 1 Report*, November, 2013, produced for NSEE by pitt&sherry, p. 2.

<sup>138</sup> CRC LCL, *Enhancing the Market for Energy Efficient Homes: implementing a national voluntary disclosure system for the energy performance of existing homes* (RP3016), July 2016.

<sup>139</sup> Australian Government Department of the Environment, Water, Heritage and the Arts, *Mandatory Disclosure of Commercial Office Building Energy Efficiency: Regulation Document*, November 2009, p. 43.

*Australian, State and Territory Governments party to the NFEF framework have signalled the intention to progressively expand the coverage of the scheme, subject to favourable regulatory impact and benefit-cost analysis. Therefore the legislation will be constructed so as to have the potential to apply in future to other classifications of commercial buildings via regulations rather than legislative amendment.*

This question was revisited in the 2015 Review. Specifically, the review considered extension of the scheme to smaller offices, data centres, shopping centres and hotels. Notably this choice of possible building types was driven by the availability of ‘as built’ NABERS ratings tools for these buildings types, rather than any other inherent market characteristics.

As noted, the Review supported a change to a 1,000sqm threshold for lease/sale events that trigger the application of the measure. However, the little-known exemption for office spaces (regardless of size) that are found in buildings where less than 75% of the net lettable area is for office purposes, will already eliminate many spaces down to 1,000 sqm size from consideration under the measure, while it would eliminate an even greater percentage of the potential market if the threshold were lowered further, as smaller office spaces are found in very many building types and not only buildings where 75% of the space is for office purposes. The intent of this exemption is entirely unclear, if it is not simply to reduce the number of office spaces covered by the measure, in apparent contrast to the stated and intended size thresholds. We note that the 75% threshold does not agree with the Australian Bureau of Statistics buildings classification framework, under which ‘primary purpose’ is determined by the largest function share. Nor is the threshold relevant to NABERS, as the NABERS rating process already eliminates ‘non-office’ spaces from consideration and, apart from this, applies to the whole building. Also, since CBD applies to office spaces, and not primarily to buildings, it is difficult to see how the function of the building that houses the office space is relevant.

There is no evidence that the 2015 Review tested other size thresholds, such as 500sqm. Forthcoming analysis undertaken by pitt&sherry for the City of Sydney suggests that a 500sqm threshold would be cost effective.<sup>140</sup> Further, we note that the RIS for the proposed residential mandatory disclosure scheme identified an economically preferred option which involved a simpler and less expensive disclosure requirement than a full rating, and if this approach were taken for commercial buildings, it would remove the potential barrier to reducing the minimum size thresholds for application of the CBD scheme.

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<sup>140</sup> pitt&sherry, *Office Sector Emissions Modelling Foundation Report: Final Report*, forthcoming, commissioned by the City of Sydney.

The 2015 Review dismissed data centres for consideration under the measure on the grounds that the Power Usage Effectiveness (PUE) metric used by NABERS is primarily relevant for co-located data centres/clients, estimated to be 21% of the total data centre market. It was also noted that some data centres prefer to use international benchmarking tools, as they may have greater recognition with their international clients. Third it was noted that data centre energy consumption is considered commercially sensitive. Finally, the NABERS tool was new, with little usage of it at that time by the sector.<sup>141</sup>

The ‘retail sector’ was eliminated on the grounds that only shopping centres are covered by NABERS ratings tools, and only some 300 shopping centres Australia-wide could potentially be rated using the tool, of which 50 were doing so on a voluntary basis at that time. Also the NABERS tool only rates base building energy consumption, and the Review cites data suggesting that tenancies are responsible for the majority of shopping centre energy use. Finally, however, ACIL Allen for the view that retail buildings should be not be covered by CBD because (pp 89 – 90):

- *The information asymmetry problem is not judged to be acute, as shopping centres are already currently required by state legislation to disclose (base building) energy costs to prospective tenants.*
- *While the split incentive problem exists (with building owners controlling capital expenditure and tenants generally paying for base building energy, and the law prohibiting the recovery of capital costs from tenants), information on the energy efficiency performance of a shopping centre, made available through mandatory disclosure, is unlikely to exert much influence on the decision-making of prospective tenants.*
- *In addition to the imbalance in the bargaining power of shopping centre owners/operators and prospective tenants, other factors, such as site size and configuration, location (of the shopping centre and the site under consideration within the shopping centre) as well as rental price and conditions, are likely to matter far more to them as these are the key determinants of a tenant’s profitability.*
- *The total amount of energy use covered by rating tools is unlikely to cover more than 50 per cent of the retail market. The remainder of the retail sector is characterised by a very high level of diversity between sites and low energy savings per site. Hence, it is unlikely that a benchmarking tool such as NABERS will be useful at this level. Other measures, such as green leases, may be a better way of advancing energy efficiency at this level.*

Hotels were eliminated from consideration on the grounds there was limited uptake of the NABERS hotels tool at the

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<sup>141</sup> ACIL Allen (2015), p. 88.

time (some 21 ratings) out of an estimated 520 NABERS rateable hotels in total in Australia, of which only 20 – 30 would be sold or leased annually. Motels, serviced apartments, visitor hostels, etc., are not covered by the tool. It was also noted that utility costs make up less than 5% of hotel industry costs, compared with 40% for wages. Therefore, “energy costs do not appear to be a key concern for hotel owners and managers” (p. 90). Remarkably high costs of \$3,505/room were cited as the cost of a 1 star upgrade to 3 stars or more. In short, ACIL Allen did not support extending CBD to hotels on the grounds that (p. 91):

- *There is no split incentive problem if hotel operators are also owners of the hotel buildings. Even if they do not own the buildings, they have a natural incentive to seek out buildings that are more energy efficient and have lower energy costs, holding all other building characteristics constant.*
- *If energy efficiency is an important attribute in the selection of buildings by hotel operators, they could demand information on a prospective property's energy efficiency performance (which would likely be acceded to by building owners because assessment costs are very small in comparison to the value of a typical transaction). However, it is not clear that energy efficiency matters greatly to buyers or lessees of hotel buildings, in comparison with other factors, such as geographic location. In either case, mandatory disclosure is superfluous for overcoming the information asymmetry problem.*

We note that hotels are increasingly operated on a franchise basis, with the buildings being owned by a party independent of the hotel operator. The second point simply dismisses the information asymmetry problem as too small to be of concern. However, the Commercial Building Baseline Study confirms that hotels are relatively energy-intensive buildings. To the extent that direct commercial pressures on hotel operators to use energy efficiently are weak, for the reasons cited in the Review, and noting that intensive use of energy is associated with significant unpriced external costs, alternative solutions may be required – including continuous disclosure, as discussed below.

Setting aside the issue of building coverage, another key design parameter for CBD is the trigger point. At the moment, the scheme is only triggered when an office space of the required size is offered for sale or lease. This effectively restricts the scheme to ‘commercial’ buildings – that is, those where turnover of space (or buildings) is a key part of the business model. Owner-occupied buildings – including office buildings – any building with longer-term tenancies (like many hotels), and institutional buildings (hospitals, schools, universities, museums, etc.), are all excluded by this model – in addition to all the commercial spaces (like the majority of the retail sector) for which there is no NABERS tool.

In recent work with the office sector for the City of Sydney, the question of the CBD trigger arose in the context of the

observation that owner-occupied offices appear to be less efficient, on average, than those owned by property institutions and trusts – something which economic theory would not predict: owner-occupiers have no split incentive. Stakeholders suggested that the likely explanation is the lack of a trigger event. The market response to CBD by property trusts and institutions has included essentially continuous rating and disclosure, as this aligns with their high-turnover business model – i.e., continuous trigger events – and it also quickly translates the value of energy efficiency upgrades into market value. This aligns with the observation that ‘green’ buildings have a higher commercial value, which is particularly important for property institutions and trusts, as it maximises their financial leverage, enabling faster growth of the building portfolio.<sup>142</sup>

Owners of owner-occupied buildings – lacking that commercial pressure – are less likely to be aware of the relative energy performance of their building or the opportunities to reduce outgoings, and simply pay their bills. A trigger event – such as mandatory continuous disclosure, as occurs in Europe under the Energy Performance of Buildings Directive, regardless of ownership status/building type – would provide external and expert information to the organisation, including (as already occurs in CBD) advice about options to improve efficiency and save money. Such disclosure could also trigger competitive pressure via reputational risk. Many institutions, such as schools and universities in particular, would be sensitive to be graded poorly in any public manner – regardless of whether buildings or spaces are traded – creating an incentive to take action to improve their ratings, which would also reduce costs and emissions.

When considering the overall effectiveness of the scheme, it is worth comparing CBD to similar schemes in other countries. The 2015 Review did this and concluded: “The design of the program is...broadly in line with international best practice, although it is more light-handed than some programs in Europe and North America” (p. 34). More specifically it found (pp 32 – 33), *inter alia*:

*The New York City program is more heavy-handed than the CBD program as it mandates lighting upgrades and requires an energy audit and tuning, or retro-commissioning, of energy equipment in large buildings every ten years. Likewise, air-conditioning systems in non-residential buildings in the UK must be inspected every five years.*

*In England, Wales and some European countries, the energy performance of significant public buildings (over 500m<sup>2</sup>) must be publicly displayed. This requirement is absent in Australia.*

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<sup>142</sup> The Australian Property Institute/Property Funds Association, *Building Better Returns: a study of the financial performance of green office buildings in Australia*, September 2011.

While the CBD program required generic guidance on improving energy efficiency to be included on the BEEC (a requirement which will be scrapped), the European programs require a tailored recommendation report for each building.

While the CBD program has a threshold of 2,000 m<sup>2</sup>, the programs in Austin and Washington state have a threshold of 10,000 square feet (929 m<sup>2</sup>) while the New York City program targets buildings over 50,000 square feet (4,645 m<sup>2</sup>). The UK's non-residential EPC program covers all buildings including factories, offices, retail premises and public sector buildings, regardless of size.

'More light-handed' is equivalent to less ambitious, less stringent, and more restricted in scope. Yet, as theory predicted and the 2015 Review demonstrated, this is a highly effective and efficient policy model. Seeking opportunities to widen its scope and application as far as possible – including by overcoming the limitations of being tied to the few building classes that have NABERS ratings tools, to larger spaces, to buildings where 75% or more of the building has a particular purpose, and to lease/sale trigger events – would all increase the scheme's effectiveness and resulting energy/emissions savings, without significantly increasing its overall cost.

#### NatHERS

The Nationwide House Energy Rating Scheme (NatHERS) is a key plank of the national energy efficiency policy framework for residential buildings in Australia. It is in essence an accreditation scheme for software tools that provide thermal performance ratings for Class 1 (detached and semi-detached) and Class 2 (multi-unit dwelling) buildings. For Class 2s, it is the units, rather than the whole building, that is rated. The NatHERS website describes the scheme as a 'measuring tap for rating residential building energy efficiency'.

Several rating tools – including AccuRate, BERS Pro and FirstRate5 – are currently accredited under the NatHERS scheme. These tools generate star ratings, from zero to ten, based on the assessed thermal performance of house designs, specifications (including construction materials) and climate zone. The scheme does not assess the efficiency of fixed or plug-in appliances or lighting systems or account for any PV systems that may be connected to the house. The star ratings are specific to (68) different climate zones, and represent a value of 'predicted annual energy load for heating and cooling based on standard occupancy assumptions', measured in MJ/m<sup>2</sup>.<sup>143</sup>

The NatHERS program is managed by the Australian Government (Department of the Environment and Energy) on behalf of all Australian Governments (not including local

government). The NatHERS Administrator is a team that is responsible for:

- accreditation of NatHERS software tools
- approval and oversight of NatHERS Assessor Accrediting Organisations (AAOs)
- Development and maintenance of NatHERS Protocols and procedures;
- Management of upgrades to CSIRO's Chenath calculation engine (which currently underpins all of the NatHERS software tools);
- Communication with industry, government and consumer stakeholders; and
- NatHERS development.<sup>144</sup>

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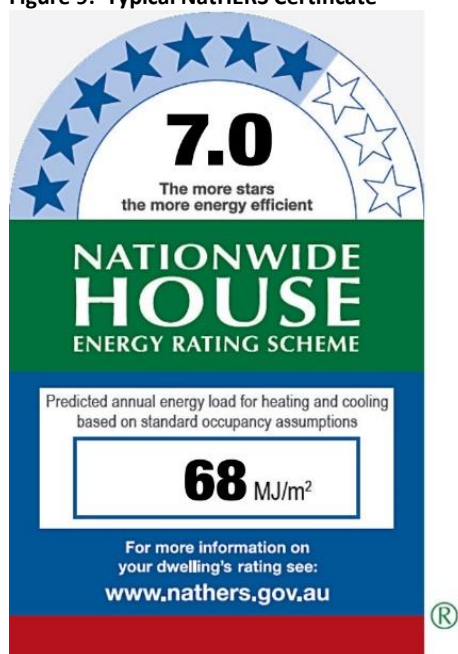
<sup>143</sup> <http://www.nathers.gov.au/about>, viewed 17 January 2017.

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<sup>144</sup> <http://www.nathers.gov.au/governance>, viewed 17 January 2017.



Figure 9: Typical NatHERS Certificate



While NatHERS ratings and assessment tools can be used for purely voluntary purposes – to study and improve the thermal performance of designs, or to rate and voluntarily disclose the performance of buildings – they are also, and more commonly, used to demonstrate compliance with the National Construction Code’s energy performance requirements for residential buildings. The Housing Industry Association estimates that 71% of new residential buildings (Class 1 and units within Class 2 buildings) using NatHERS tools to demonstrate compliance with the Code’s energy performance requirements (noting that there are some requirements that are additional to the star rating).<sup>145</sup>

#### Assessment

There have been numerous criticisms levelled at NatHERS over the years, but many of them are either not valid or not attributable to the NatHERS scheme itself, while others have been addressed.

During the *National Building Energy Efficiency Project* (late 2013 – 2014), an extensive consultation process was undertaken with the building industry (including local and state government officials, and a full range of industry professionals) as part of a ‘...national review of key systemic or process weaknesses or points of non-compliance with the energy performance requirements in the National Construction Code and related issues’.<sup>146</sup> This process

revealed many concerns and criticisms that related to NatHERS in some way. These included:

- Many (most) jurisdictions allow non-accredited persons to undertake NatHERS energy assessments for NCC compliance purposes
- Energy assessors are seen as conflicted and not at arms-length from builders
- Concern about the accuracy of assessments (see further below)
- Concern about the scope for ‘gaming’ results to make non-compliant designs appear compliant
- A lack of research and development of the Chenath engine and NatHERS accredited tools
- A lack of communication and consultation between officials and industry
- Concern about the performance of NatHERS tools/Chenath in rating summer performance/humid/tropical climates
- Numerous detailed concerns about assumptions and settings, particularly in ratings mode
- Consumers fail to understand or appropriately value ratings.

Also in 2013-14, Floyd Energy and others undertook a *NatHERS Benchmark Study*, commissioned by the Department of Industry. This study – a draft of which had been released to at least some stakeholders at the time the consultations described above were undertaken – concluded, *inter alia*, that only around 1 in 5 assessors, in a volunteer sample of 344 assessors, obtained the correct rating value, although 37% were within 0.25 stars and almost 60% within 0.5 stars. Error rates tended to increase with more complex designs.<sup>147</sup>

Similarly, in late 2013, a draft of CSIRO’s *Evaluation of 5 Star* had been released to some stakeholders for comment.<sup>148</sup> This very detailed study, based on careful monitoring and assessment of 414 houses in three climate zones over a winter and summer period, aimed to determine whether 5 star houses (only Class 1a1 – detached - dwellings were considered) actually reduced heating and cooling energy use, relatively to the earlier 3.5 – 4 star standard, to the extent predicted in the relevant RIS, and also whether the actual costs and benefits aligned with those predicted.

This study made many findings, including that cooling energy use in summer was greater in the 5 star houses, in Brisbane and Melbourne, than it was in the 4 star houses. On the other hand, winter savings of energy use were higher than predicted. Overall, emissions were 7% lower for the higher rated houses, but these results by season fed criticisms by industry to the effect that NatHERS models and predicts

<sup>145</sup> <http://www.nathers.gov.au/governance/national-construction-code-and-state-and-territory-regulations>, viewed 17 January 2017.

<sup>146</sup> pitt&sherry (2014), p. vii.

<sup>147</sup> Floyd Energy, *NatHERS Benchmark Study*, February 2104, p. 7.

<sup>148</sup> CSIRO (M. Ambrose et al), *The Evaluation of the 5-Star Energy Efficiency Standard for Residential Dwellings: Final Report*, December 2013.



summer energy use poorly, and particularly in warmer climate zones. Some put the criticism more strongly, arguing that NatHERS encourages the construction of 'hot boxes' that require excessive cooling energy consumption in summer to remain comfortable, or encouraged inappropriate designs for warmer/tropical climate zones.

A further common criticism, as reported in the NEEBP project for example, is that NatHERS fails to model the full range of energy end-use in houses and, at least in ratings mode, makes assumptions that may not be representative of common or average household behaviours.

A proper investigation of these issues is well beyond the scope of this study. More generally, however, these criticisms represent a mix of factors, some of which are attributable to NatHERS and some of which are not. For example, while the CSIRO Report conceded that "...we need to improve our understanding of summer-time house cooling energy efficiency", it also noted that methodological limitations in the study prevent any generalised conclusions being drawn. To the extent that there is evidence of better winter performance than summer, this is most likely attributable to decisions made by designers and builders to achieve the 5 star requirement (which, as noted, is a total predicted energy load for heating and cooling, not separate summer values) at least cost – for example by adding insulation (which is relatively) cheap, but failing to provide adequate eaves or other window shading structures, or high-performance glazing – because these are more expensive. The 5 star standard was (as the current 6 star standard is) a performance based, and not prescriptive, standard, and it was the intent of regulatory process that the industry would find least cost ways of meeting the standard. As is discussed in Section 4.2, NSW applies separate summer cooling and winter heating thermal energy load limits as a way of disciplining this observed tendency.

Given this, it is a difficult question to answer whether Chenath – the software 'engine' supporting all NatHERS ratings tools – performs well in predicting summer/hot/humid climate house performance: this requires a careful technical assessment, preferably with extensive engagement of the (critical) stakeholders in that process, so that they have 'buy-in' to the research findings. However, it is a policy rather than a technical question as to whether separate heating and cooling requirements should be applied in the National Construction Code. Arguably, it is a criticism of the scheme that these summer performance issues – both technical and policy – which have been raised by stakeholders over an extended period – are only now being addressed.

Clearly, the ways in which states and territories regulate industry professionals is well beyond the scope of the NatHERS scheme itself. Similarly, contractual arrangements that are permitted between industry professionals is a policy and legal question, unrelated to the NatHERS scheme. The proficiency of energy assessors, on the other hand, is something for which the scheme should be accountable, as it goes to the credibility of the scheme and of the NCC's energy performance requirements.

Concerns expressed regarding ratings mode settings, and the extent to which these directly correspond to real world behaviours, are very largely misplaced. The intent of NatHERS, particularly in ratings mode, is not to accurately predict household energy consumption – it is to provide a consistent methodology for assessing and comparing the performance of designs under controlled conditions. Practically, if assessors were free to alter settings such as occupancy hours, thermostat settings, window treatments and others – ostensibly to reflect the intended householders' unique preference set or household composition – this could readily be used to game the performance requirements, in reality to avoid cost, leaving behind the legacy of a poorly performing structure. Further, even if it were the case that the first occupant of the house had specific and unusual comfort preferences, there is no guarantee that the second, third and nth occupant would share those same preferences. As noted, there is an extent to which house have public good characteristics – including that they need to be fit for the generalised purpose of providing comfortable living conditions for an average household, and not only for extreme points on a preference distribution curve.

The general criticism that consumers (householders) fail to understand and value NatHERS ratings appears to have some validity. Energy assessments are more likely to be treated as an unwanted cost than as a source of consumer value – notwithstanding that an assessment that led to an improved design could save the householder many thousands of dollars in energy cost, and even in first construction cost.<sup>149</sup> It is possible that budget restrictions have prevented the NatHERS program in engaging an active and sustained public communication program – and these are indeed expensive. Also, the absence of point-of-sale mandatory disclosure (except in the ACT – and unlike in Europe), when combined with a lack of appropriate information, means that the importance of the rating is not understood by many consumers. Further, it would appear that energy assessments are obtained late in the regulatory process, and generally well after house designs are settled. This means that the opportunity for the householder to derive real value from them may be limited – and this will be more so the case if the intent and meaning of the assessments is not well understood. It may be that greater prominence should be given to the 'design review' phase of the development and regulatory approval processes, and the reasons for this (the value proposition) clearly explained to consumers through multiple and effective channels. We note that the LJ Hooker Institute has done valuable research in this area, via its 17 Things approach, while the EnergyFit Homes research cited earlier equally provides a strong evidence base upon which to design an effective communications approach.

An emerging risk is that of concentration in the ownership and control of ratings tools under NatHERS. Two of the three

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<sup>149</sup> Sustainability House, *Identifying Cost Savings through Building Redesign for Achieving Residential Energy Efficiency Standards*, March 2012.

tools noted above are owned or exclusively licenced by the same party, while the third tool (FirstRate 5) had been flagged for privatisation, creating the risk of a monopoly. Feedback, however, suggests that the Victorian Government no longer intends to privatise FirstRate5. Monopoly pricing of ratings software or services would be strongly resisted by the buildings industry, with potential serious consequences for NatHERS, at least in the context of its use for regulatory compliance. COAG Best Practice Regulation Guidelines clearly require the consequences of regulation for competition to be taken into account.<sup>150</sup>

As noted, many criticisms of NatHERS appear to have been well addressed already. For example, in August 2015 the NatHERS Steering Committee released a Strategic Plan for 2015-2018. The Strategic Plan was developed in collaboration with stakeholders to establish a clear and focused strategy for progressing NatHERS. The Strategic Plan outlines the context in which NatHERS operates, the overall vision for NatHERS, its core mission and values, and actions to be achieved out to 2018. In November 2016 the NatHERS Steering Committee released an update to the NatHERS Strategic Plan 2015-2018, and a new Strategic Plan will be developed for 2018, with work commencing on this during 2017.

In 2016 a NatHERS Governance and Operational Review was also conducted to identify further areas for improving NatHERS. This review sought stakeholder views and made a number of recommendations to improve the Scheme. The NatHERS Steering Committee responded to the recommendations in the review and work is currently underway to implement the NatHERS Steering Committee agreed recommendations. These can be found at [www.nathers.gov.au/governance](http://www.nathers.gov.au/governance).

The NatHERS Administrator has taken steps to increase the quantity and quality of communication with stakeholders, including holding annual forums, setting out longer term strategic plans and reporting progress against that plan by KPI. An MOU with the Australian Building Codes Board has been struck to create greater alignment and certainty for both parties, particularly when technical upgrades to the scheme are made.

Overall, it is clear that NatHERS is effective in achieving energy, greenhouse and financial savings. It represents an important and performance-based method for demonstrating compliance with the NCC energy performance requirements, which maximises flexibility for designers and builders and enables them to achieve least-cost outcomes. The experience of the *National Energy Efficient Buildings Project*, however, suggests that the intent of the scheme is poorly understood in some quarters of industry. All industry and stakeholder concerns should, as a matter of course, be addressed in a timely manner – whether the concerns are legitimate or otherwise – in order that the scheme is seen to

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<sup>150</sup> COAG, *Best Practice Regulation: a guide for ministerial councils and national standard setting bodies*, October 2007, p. 4.

be responsive to industry. However, such responsiveness need not come at the expense of discrimination – concerns that are invalid should be called out, while legitimate or potentially legitimate concerns should be – and be seen to be – adequately addressed in a timely manner. This of course requires that the administration of the scheme is adequately funded.

Also, as noted above and documented in the NEEBP, there is some evidence that aspects of the wider regulatory regime for building energy performance – managed by the states and territories – are not fully supportive of NatHERS achieving its full potential. It is difficult to understand, for example, how the practice of allowing unaccredited parties to assess the performance of long-lived and expensive assets – which consumers are not well-equipped to do themselves – and which will contribute to greenhouse gas emissions as well as energy costs for decades – is consistent with appropriate standards of consumer or environmental protection. Yet six out of eight jurisdictions in Australia allow this.<sup>151</sup>

Minimum Energy Performance Standards (MEPS) and Labelling

The terms of reference for this project exclude consideration of ‘small appliances’. However, some important classes of building equipment are covered by MEPS, and therefore the program is covered briefly.

The minimum energy performance standards (MEPS) and labelling program has been one of the longest-standing and most successful energy efficiency and greenhouse gas abatement programs in Australia (and New Zealand – as the program is managed as a trans-Tasman endeavour). Standards were previously legislated by states and territories, but from 1 October 2012, the Federal Government’s *Greenhouse and Energy Minimum Standards (GEMS) Act 2012* took effect as the legislative underpinnings for the program. A 2012 study by the US-based Lawrence Berkley National Laboratory (LBNL) “...showed that Australia compared well internationally, in particular with regards to balancing rigour with market conditions and other factors”.<sup>152</sup> An example of this was the use of overseas RISs, and preferencing international standards, rather than repeating these studies and determining appropriate standard specifically for Australia.

At the same time, the program in recent years – and until a recent change – has been essentially dormant. While detailed and current program statistics have been difficult to find, the 2015 Review of GEMS noted that E3 Committee members (the Equipment Energy Efficiency

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<sup>151</sup> Only NSW and Tasmania require all energy assessors to be accredited – pitt&sherry (2014), p. xvii.

<sup>152</sup> Databuild, *Greenhouse and Energy Minimum Standards (GEMS) Review 2015 Report*, produced for the E3 Committee, p. 67.

Committee manages the program) themselves documented that program implementation has slowed since GEMS was introduced,<sup>153</sup> and that there are “Some perceptions that the structure holds up the process...”. Specific causes noted included:

- Federal and state government concerns about ‘red tape’ and the actions of the Office of Best Practice Regulation stalling progress with RIS development and decision-making
- The Australian Government’s introduction of a regulatory offsets program, requiring those proposing new regulation to be offset, including by removing other regulations – the 2015 Review notes that “...no new regulations have been put to the [COAG] Energy Council for decision since this policy came into effect”<sup>154</sup>
- Varying degrees of commitment to taking action on climate change between jurisdictions, leading to “...a lack of involvement from some states and territories”<sup>155</sup>
- Reductions in regular data collection – making it more difficult to identify and evaluate regulatory opportunities
- “...a lack of resources to undertake work”.<sup>156</sup>

The Review supported the continuation of the Act and overall framework, but identified numerous opportunities “...to reduce regulatory burden and improve outcomes”.<sup>157</sup>

The program covers several classes of equipment relevant to building energy efficiency:<sup>158</sup>

- Ballasts for fluorescent lamps
- Linear (and compact) fluorescent lamps
- Air conditioners (3 phase)
- Close control air conditioners (e.g., for computer rooms)
- Commercial chillers.

At the same time, there are currently no standards for:

- Fans (non-domestic)
- Light emitting diodes
- Data centres
- Insulated ducting
- Windows/glazing.

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<sup>153</sup> Ibid, pp 55 – 56.

<sup>154</sup> Ibid, p. 56.

<sup>155</sup> Ibid, p. 58.

<sup>156</sup> Ibid, p. 56.

<sup>157</sup> Ibid, p. 65.

<sup>158</sup> This data is sourced from <http://www.energyrating.gov.au/suppliers/registration/regulated-products>, viewed 18 January 2017.

## Other Policies and Measures

### Green Star

Green Star is an important part of the national building energy efficiency framework, but is an industry-led initiative rather than a government policy or program. The initiative is managed by the Green Building Council of Australia, which is a not-for-profit organisation established in 2002. GBCA has over 650 member organisations, which include local, state and federal governments in addition to companies. Its mission is to introduce and drive the adoption of sustainable practices in the Australian property industry. Green Star claims “...to operate Australia’s only national, voluntary, holistic rating system for sustainable buildings and communities”.<sup>159</sup>

Green Star is widely acknowledged as a highly successful industry initiative. Its website notes that over 1,350 projects have been Green Star certified over the period since 2003. Its 2013 Report, *The Value of Green Star*, which was based on data from 428 certified projects, notes that, on average, Green Star certified buildings produce:

- 65% less ghg emissions, and 66% less electricity, than average Australian buildings
- 45% less ghg emissions, and 50% less electricity, than those built to minimum Code requirements
- Total ghg savings (at that time) of 625,000 t CO<sub>2</sub> per year,

in addition to significant water and waste reductions. It also noted that 5.5 million square metres of building space had been certified at that time.

While this project focuses on government policy and regulation, Green Star provides a good example of what can be achieved by motivated industry segments. The program is clearly well-supported by its members, and the brand is well-recognised and highly valued in the property market. We are not aware that its performance claims have been independently reviewed, and it is likely that similar non-additionality issues will arise as documented for NABERS above. That is, the performance of Green Star certified buildings may also have been affected by other policies, such as white certificates schemes, the former Green Building Fund, NABERS, the Emissions Reduction Fund (although this is less likely). Clearly, Green Star buildings perform well above mandatory minimum levels, so non-additionality with NCC savings would not be an issue.

The success of Green Star is also testament to the power of certification and branding. In the case of CBD, and to a slightly lesser extent NABERS, a ‘government seal’ underpins the credibility and market value of the ratings documented. However, Green Star ratings are also perceived as credible and valuable in the buildings market. Green Star has developed a more comprehensive product suite than NABERS

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<sup>159</sup> <http://new.gbca.org.au/about/>, viewed 17 January 2017.

– including applicability to all building types, refurbishments, fitouts, precincts, communities and neighbourhoods – and is arguably more responsive, as a member-based organisation, to the requirements of its industry. While there are some who query the need for both NABERS and Green Star, in practice the two schemes have worked alongside each other for a decade and a half without major tensions, and the property industry appears to have little difficulty in distinguishing their roles. Initially, Green Star was perceived as primarily a tool for the certification of new building designs, while NABERS focused on the actual performance of existing buildings. However, this line has been blurred over the years, with NABERS offering a Commitment Agreement process to developers – designed to ensure that they achieved a pre-committed NABERS rating as built, and receive branding rewards for doing so – while Green Star offered ‘as built’ and then ‘performance’ (or operational) tools.

From an analytical perspective, Green Star, like NABERS, is likely to suffer from information asymmetry and adverse selection issues, which CBD is designed to overcome. That is, there is little incentive for the owners of poorly-performing buildings to advertise this fact; doing so could damage the prospects of that building in the sale or lease market. For more motivated owners, and owners in more competitive market segments (offices in commercial business districts, for example), the voluntary approach – including benchmarking and information aspects – can clearly be sufficient for them to achieve very high levels of energy efficiency.

#### *National Energy Productivity Plan*

The National Energy Productivity Plan (NEPP) was adopted by COAG in December 2015. It sets a target of Australia improving its energy productivity by 40% by 2030. Perhaps more importantly, it sets out a work plan and set of potential actions that could help to achieve this outcome. It is important to stress, however, that the Plan is essentially a research program which notes that decision makers will consider options. The individual measures in the Work Plan will each need to come back to COAG Energy Council or other government processes for decision. At this stage, there is no announced government commitment to implement the majority of these measures.

Key research programs of relevance to the energy/carbon performance of the built environment are as set out in Table 2 below.<sup>160</sup>

Item 5 of this Work Plan provides the opportunity for the question of mandatory disclosure of residential building performance to be revisited – as noted, this was proposed in the National Strategy on Energy Efficiency in 2009 but was not able to be agreed despite considerable analysis in following years. We would encourage a wider focus, as in

Europe, whereby mandatory disclosure applies in some form to all building types. For buildings forms that are not often traded, such as institutional and educational buildings, a mandatory audit at least every three years would ensure that building managers are well informed as to current abatement potentials, while the disclosure element – which should include prominent display of a building’s rating – would create the opportunity for external parties to offer services and for Boards or management committees controlling such buildings to have some accountability for building performance.

#### Emissions Reduction Fund

The Emissions Reduction Fund is regarded as the Government’s primary mechanism for reducing emissions. It is made up of three elements: crediting, purchasing and safeguarding emissions reductions. The ERF provides incentives for emissions reduction projects by crediting abatement from activities done in accordance with approved methods. A range of existing methods, particularly those supporting energy efficiency and waste projects, support emissions reduction projects in the built environment.

Five existing methods are available to support energy efficiency activities in buildings:

- Commercial Buildings credits emissions reductions associated with improvements in whole of building energy consumption (as measured by the National Australian Built Environment Rating System—NABERS);
- Commercial and Public Lighting credits emissions reductions from commercial and industrial building lighting system performance upgrades, as well as public lighting efficiency improvements, including for pedestrian, street and traffic lighting;
- High Efficiency Commercial Appliances credits emissions reductions from projects that choose to install high efficiency commercial appliances rather than appliances with market average performance;

<sup>160</sup> Australian Government COAG Energy Council, *National Energy Productivity Plan: work plan*, undated.

Ref. No.	Title	Description
5	Improve residential building energy ratings and disclosure	The Council will work with the buildings sector to research options and consider a range of different tools and measures to improve information for residential buildings, including the costs and benefits of disclosure requirements.
9a	Expand commercial building ratings and disclosure – updated CBD program	The Commonwealth has undertaken a comprehensive review of its Commercial Building Disclosure scheme which has identified benefits of mandatory disclosure for both tenants and building owners. As described above, this process has led to an agreement to reduce the threshold under this program to 1,000 sqm.
9b	Expand commercial building ratings and disclosure – extend ratings schemes to other building types	<p>The Council will work with NABERS to consider options to extend the development and use of these ratings schemes in other types of large buildings, such as hotels, hospitals and aged care facilities, schools and universities, data centres, apartment buildings, and retail facilities.</p> <p>The Council will consider options for the development in partnership with industry of innovative approaches for addressing barriers to energy productivity improvements in mid-tier office buildings, including targeted promotion, tool development and innovative financing mechanisms (for example Environmental Upgrade Agreements or Finance).</p> <p>Recognising the importance of the efficient operation of Building Management systems and Heating, Ventilation and Air Conditioning and Refrigeration (HVAC&amp;R) systems to energy productivity in large buildings, the Council will work with industry on investigating standards and options for the promotion of best practice in the design, commissioning and maintenance of these systems.</p>
31	Advance the National Construction Code	<p>The Council agrees that given the longevity of buildings, which will stand in many cases beyond the middle of the century, and the extent of industry developments since the last significant change to minimum residential and commercial building energy efficiency standards in the National Construction Code in 2010, there are very likely strong productivity and emissions reductions benefits in further revising energy efficiency requirements in building codes for both residential and commercial buildings.</p> <p>The Council will engage in an intensive research programme to inform development of updated building efficiency requirements.</p> <p>The Council recognises industry-led contribution on building codes, and will facilitate engagement with the Australian Building Codes Board (ABCB) and Building Ministers Forum to consider changes to the Code so as to achieve better energy efficiency outcomes for Australia's buildings within the next cycle of revision of the Code, to be complete by 2019, and subsequent triennial revisions. Proposed changes would need to be available for consideration by the ABCB for the 2019 edition of the Code.</p>
32	Improve compliance with building energy efficiency regulation	<p>The Council recognises the importance of improving compliance with the energy performance requirements of the Code. To achieve this, the Council will continue to support the National Energy Efficiency Building Project (NEEBP).</p> <p>The NEEBP will expand existing local government pilot schemes to further trial compliance auditing and document control tools through building regulation professionals nationally.</p> <p>NEEBP will partner with all levels of government and building and construction product and building industry peak bodies to target design non-compliance, material substitution, skill or knowledge deficiencies and work practices that compromise new building energy performance.</p> <p>The NEEBP will collaborate with government and non-government consumer protection organisations nationally to advocate for and support consumers experiencing compromised energy efficiency in new and modified buildings as a result of non-compliant building, design and approval practices.</p> <p>The Council will also consider what additional activities may be needed to improve compliance in the context of any new or changed rating and disclosure arrangements arising through work under this plan.</p>

**Table 2: Building Related Elements of the National Energy Productivity Plan Work Program**

- Refrigeration and Ventilation Fans applies to refrigeration systems and commercial building ventilation systems, supporting two distinct energy efficiency activities: installing high efficiency fans instead of fans with market average performance, with or without replacing existing fans; and

upgrading existing small fans by replacing inefficient motors with efficient electronically commutated motors; and

- Industrial Electricity and Fuel Efficiency applies to emissions reductions in various sectors and takes climatic and other variables into account in



calculating emissions related to energy consumption.<sup>161</sup>

Businesses with a registered project have an opportunity to sell their Australian carbon credit units to the Australian Government, represented by the Clean Energy Regulator. The Regulator runs auctions to select the lowest cost abatement. If a business's bid is successful at auction, they automatically enter into a contract with the Clean Energy Regulator to deliver Australia carbon credit units. The business will receive payment for Australian carbon credit units delivered at the price they bid at auction.

#### Carbon Neutral Program

The Carbon Neutral Program is a voluntary scheme which certifies products, business operations or events as carbon neutral against the Australian Government's National Carbon Offset Standard (the Standard). The Standard provides integrity through its guidance on genuine voluntary offsets and its minimum requirements for calculating, auditing and offsetting a carbon footprint to achieve carbon neutrality. The National Carbon Offset Standard is being expanded to include buildings and precincts. The Department has worked with the National Australian Built Environment Rating System and the Green Building Council of Australia, carbon accounting experts and property sector businesses to develop a draft National Carbon Offset Standard for Buildings and a draft National Carbon Offset Standard for Precincts. The Standards will be released in 2017. Future extension of the Standard to other operations may be possible.<sup>162</sup>

#### Clean Energy Finance Corporation

The Clean Energy Finance Corporation (CEFC) is mobilising capital investment in renewable energy, low-emission technology and energy efficiency in Australia, including in the building sector. The CEFC has committed over \$1.4 billion to investments in clean energy projects valued at over \$3.5 billion. Up to 50 per cent of the CEFC's funds are to be invested in adopting energy efficiency and low emissions technology, including in the building sector. CEFC financing solutions designed to help businesses implement commercial building energy efficiency upgrades include: Energy Efficient Loans available through the Commonwealth Bank; Environmental Upgrade Agreement (EUA) finance available in selected local government regions of New South Wales and in Victoria; and the \$400 million unlisted High Income Sustainable Office Trust (HISOT), managed by EG Group.<sup>163</sup>

As an example of the CEFC's activities, the CEFC has recently announced a \$100 million investment into the AMP Capital Wholesale Office Property Fund, in order to help the fund to develop a property portfolio with net zero carbon emission buildings by 2030. Under its investment agreement with the CEFC, AMP Capital will target the reduction to zero emissions as well as an average NABERS Base Building Energy rating of 5 stars across its portfolio by 2020.<sup>164</sup>

### State and Territory Policies

Key state and territory measures – distinct from national measures in which most states and territories participate – include (aspirational) target setting, white certificates/retailer obligation schemes, and variations to the National Construction Code. The states and territories also provide many more support measures than are evident at the national level, from information and awareness, training and education and many forms of financial assistance.

#### Targets

Key targets in place at the time of writing include:

Jurisdiction	Targets	Notes
ACT	<p>40% reduction in ghg emissions by 2020 over 1990 levels</p> <p>Zero net emissions by 2050 at the latest</p> <p>100% renewable energy by 2020</p>	<p>Current targets, noting that a process is currently underway to determine whether the net zero target can be brought forward.</p>
NSW	<p>Achieve net zero emissions by 2050</p> <p>Achieve 16,000 GWh in energy savings by 2020</p> <p>Assist 50% of NSW commercial floor space to achieve a 4-star NABERS rating by 2020</p> <p>Support 220,000 low income households to reduce energy use by up to 20% by 2014</p>	

<sup>161</sup> <http://www.environment.gov.au/climate-change/emissions-reduction-fund>

<sup>162</sup> <http://www.environment.gov.au/climate-change/carbon-neutral>

<sup>163</sup> <http://www.cleanenergyfinancecorp.com.au/>

<sup>164</sup> <http://www.afr.com/real-estate/green-fund-injects-100m-into-amp-office-towers-20170308-gut658>

Jurisdiction	Targets	Notes
VIC	Zero net emissions by 2050  5 yearly reviews to keep on track  Under the VEET scheme, achieve 6.5 Mt CO <sub>2</sub> -e in energy savings	
SA	Zero net emissions by 2050  Improve the efficiency of dwellings by 15% by 2020  Improve the efficiency of government offices by 30% by 2020.	Achieved 24% improvement in dwelling by 2013 (rel. to 2003-04 baseline)
WA	None evident	
QLD	50% renewable energy target by 2030	
TAS	60% emissions reductions by 2050 relative to 1990	
NT	60% emissions reductions by 2050 relative to 1990	Unclear whether this remains current

The NSW Government refers to the potentially sensitive issue of the relationship between state and national level targets, noting that its:<sup>165</sup>

*...aspirational objective is intended to provide a clear statement of the government's intent, commitment, and level of ambition and to set expectations about future emissions pathways that will help the private sector and government agencies to plan and act. It is consistent with the Paris Agreement which the Commonwealth Government has committed to ratifying, and is intended to complement, rather than replicate or duplicate the Commonwealth Government's shorter term national emissions reduction targets.*

<sup>165</sup> NSW Government, *Fact Sheet: achieving net-zero emissions by 2050*, November 2016.

## Retailer Obligation Schemes

As noted in Chapter 3, South Australia, Victoria, the ACT and NSW have energy savings schemes in place; the other states and territories do not. Of these, the NSW Energy Savings Scheme has been in operation the longest. It is currently targeting 7% energy savings for 2016. IPART, which administers the scheme, summarises it as follows:<sup>166</sup>

*The ESS is a state-based scheme that aims to reduce the consumption of electricity in NSW by encouraging the implementation of energy saving activities. It is established under Part 9 of the Act. The Act sets out annual energy savings targets to 2025, and obliges all electricity retailers operating in NSW and other specified parties – known as Scheme Participants – to meet these targets by purchasing and surrendering Energy Savings Certificates (ESCs or certificates). It also provides for parties to be accredited to create those certificates from recognised energy saving activities. These parties are voluntary participants in the ESS, and are known as Accredited Certificate Providers.*

Energy savings under these schemes are typically applied at the level of individual retailers and are proportionate to their electricity purchases (subject to any adjustments) – so 7% means, for each retailer, the must acquit energy savings certificates equivalent to 7% of their 2016 liable electricity (wholesale) purchases. Again, IPART explains it as follows:

*In the ESS, the energy savings target is expressed as a percentage and is applied to each Scheme Participant's annual liable electricity acquisitions to determine its individual energy savings target for the year. The percentage of liable acquisitions, less any deductions in respect of partially exempt loads, is then converted from MWh to certificates required to be surrendered by each Scheme Participant to meet its individual target.*

*The target started at 1% of liable acquisitions in 2009 and increased annually to reach 5% in 2014 and 2015. It will increase to 7% in 2016 following the recommendations of the 2015 ESS Review, and will then increase each year to reach 8.5% in 2019, after which it will remain steady until 2025.*

*A Scheme Participant's liable acquisitions includes any electricity it purchases for supply to end-users in NSW excluding a specified part of the load it supplies to entities in emissions-intensive and trade-exposed industries that have been granted an exemption from the ESS by the Minister for Industry, Resources and Energy. The energy savings target sets the demand for certificates by Scheme Participants in a year. Accredited Certificate Providers and their accredited energy savings projects create the supply.*

<sup>166</sup> IPART, *NSW Energy Savings Scheme – compliance and operation in 2015*, July 2016, p. 1.

For the most part, evaluations of ESS and similar schemes have found them to be effective. Further analysis of the policy model can be found in Chapter 3.

#### Mandatory Disclosure

The ACT Government (only) has required mandatory disclosure of housing energy performance since 1999. The scheme requires vendors and landlords to disclose the Energy Efficiency Rating of houses that are advertised for sale or lease in the ACT. The process involves a detailed verification by an independent energy assessor of key design features, and in this regard represents a significant step forward from the use of NatHERS for Code compliance purposes, where there is no ex-poste inspection to verify that claimed features are in fact present. The scheme is regarded as well enforced, and there is evidence of inaccurate ratings leading to court action.

#### Code Variations

While these will not be described in detail, the National Construction Code allows for state and territory variations to agreed provisions, even if, as noted in Section 5.1, an Inter Government Agreement indicates a notional commitment to national consistency. In practice, provisions differ in virtually every state and territory. Notable variations include:<sup>167</sup>

- The Northern Territory applies the 2009 version of the residential code (5 star) for Class 2 and 4 buildings, and does not apply Section J (commercial building energy efficiency standards) at all
- NSW applies BASIX in the place of 6 star requirements for Class 1 and 2 buildings – while we are unaware of formal comparisons, industry sources suggest that BASIX energy performance requirements are around the 5 star level; however it adds requirements for thermal breaks between the framing and external cladding of buildings
- QLD applies the 5 star standard for Class 2 buildings – past variations that allow 5 star dwellings where there is an outdoor living area with a ceiling fan have now been incorporated within the NCC itself (for certain climate zones).
- WA adds water and hot water efficiency measures.
- A VIC addition requires thermal performance levels to reflect, inter alia, 'the effects of nearby permanent features such as topography, structures and buildings; solar passive features and envelope sealing.

These variations are not required to undergo regulation impact assessment.

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<sup>167</sup> ABCB, *Consolidated Performance Requirements – 2016*, pp 102 – 195.

#### Support Measures

As noted, state and territory governments provide a very large number of support mechanisms for energy efficiency, notably at the household level, but also for small and medium sized enterprises and commercial buildings, to a lesser degree. In Victoria, for example, key measures include:

- Sustainability Victoria is established as a statutory authority whose mission is '...to facilitate and promote environmental sustainability in the use of resources.<sup>168</sup> It provides extensive information, case studies and advisory products for households and commercial buildings; and energy and resource efficiency materials for business.
- FirstRate5 – a NatHERS accredited residential ratings tool
- Calculating Cool – a self-assessment tool for HVAC systems
- A Residential Efficiency Scorecard is under development, which is expected to enable voluntary disclosure/discovery of energy efficiency ratings and thermal performance of houses.
- Environmental Upgrade Agreements – in 2015 the Victorian Government amended the Local Government Action (1989) to give the option of all local governments in Victoria offering Environmental Upgrade Agreements. As described in Chapter 3, these enable lenders to provide finance to a building owner for environmental upgrades, with the local council then collecting the repayments through its rates system and passing them on to the lender.

#### Governance and Strategic Issues

A key feature of the Australian policy context is the phenomenon of 'competitive federalism'. Even if some argue that effective competition between states and territories has been diminished in recent years<sup>169</sup>, still we witness instances, in the field of energy/carbon policy in particular, where one or more jurisdictions break ranks with the Australian Government and other states and territories – and also cases where the Australian Government offers leadership to the states and territories – with the balance between these shifting constantly based on electoral fortunes.

At present, and as noted above, most states and territories have more ambitious targets for greenhouse gas abatement or for renewable energy than does the Australian Government, while the latter has no energy savings targets or supporting scheme. It does have a 40% energy productivity improvement target by 2030 and an emissions savings target of 26% - 28% by 2030 relative to 2005 emissions.

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<sup>168</sup> <http://www.sustainability.vic.gov.au/who-we-are/>, viewed 4 February 2017.

<sup>169</sup> W. Kasper, Australia's hollow federalism: can we revive competitive governance?, *Review*, October 2007, pp 34 – 38.

The NSW Government's Draft Plan to Save Energy and Money notes that increasing BASIX targets for new homes, and also lifting standards for commercial buildings, are options it could use to meet its energy savings targets. Indeed BASIX targets are scheduled to be increased from July 2017, however, it is not clear whether such an increase would lead to performance requirements higher than the current (2010) 6 star standard in the National Construction Code.<sup>170</sup> South Australia is also investigating the case for lifting Class 2 building standards in that State, and the ACT government is also considering a range of options including potential Code upgrades. To this point, no State (unlike local governments, as discussed below) has unilaterally lifted building energy performance standards. However, if there is no agreement to lift national standards, and particularly for residential buildings, via the 2019 National Construction Code, it now seems likely that several jurisdictions will do so themselves in any case.

Overall, while industries complain of different standards in different jurisdictions, the incremental costs – such as transactions costs – that this might create need to be weighed against the opportunity costs associated with failing to lift standards which, for want of maintenance, have long since ceased to advance the public interest.

## Local Government

Around the world, and not only in Australia, local government is increasingly being recognised as a critical driver of action on climate change abatement. Initiatives like the Compact of Mayors<sup>171</sup>, the Compact of States and Regions<sup>172</sup>, EnergyCities<sup>173</sup> and others are providing a strong international context and support mechanisms for co-ordinated action. This development reflects both a widespread frustration with a lack of progress on climate change action at national and international levels, but also a growing realisation that action to address climate change is ultimately everyone's responsibility, and that cities and regions are an ideal scale to create sustainable and positive local solutions.

In Australia, Sydney, Melbourne and Adelaide are members of the international Carbon Neutral Cities Alliance (CNCA), a group of cities targeting either carbon neutrality or at least deep cuts in greenhouse gas emissions. This reflects the fact that these three cities – and indeed now many more – have set targets of achieving net zero emissions or carbon

neutrality – in the case of Sydney, by 2050; Melbourne, by 2020; and Adelaide, 'world's first'. Indeed, a recent survey by Beyond Zero Emissions established that 1 in 5 Australian councils have set targets to achieve zero emissions, 100% renewable energy or both, although not all of these targets are community-wide.<sup>174</sup>

The significance of these developments is hard to overstate. For the most part, local governments play an important role in the built environment, including establishing planning schemes and processing development approvals. In some states, such as South Australia, planning functions are retained by the state. Already at least seven Victorian councils apply a planning framework known as SDAPP – Sustainable Design Assessment in the Planning Process. SDAPP:<sup>175</sup>

- *Recognises the role of local governments as a statutory authority for planning matters;*
- *Provides a framework for consideration of sustainable design elements of planning applications; and,*
- *Offers a consistent method for identifying opportunities for improved environmental building performance.*
- *Ensures that sustainability is considered at the very early design phase – the best time to maximise opportunities for good orientation and other initiatives that create liveable, comfortable, efficient buildings.*

Importantly:<sup>176</sup>

*SDAPP is intended to facilitate environmental performance outcomes that are above the minimum requirements under building regulations, principally the Building Code of Australia (Victoria), with care taken to ensure no inconsistencies with these regulations.*

The State of Victoria disputed the right of local councils to apply such policies, and the matter was referred to the Victorian Civil & Administrative Tribunal (VCAT). An Environmentally Efficient Design Advisory Committee (the Committee) was appointed by the Minister for Planning on 15 June 2013 under section 151, 153 and 155 of the Planning and Environment Act 1987.<sup>177</sup> VCAT upheld the right of Councils to apply the policies, noting that it would be highly cost effective to do so, and also deliver significant

<sup>170</sup> NSW Government, Office of Environment & Heritage, *A Draft Plan to Save NSW Energy and Money*, 2016.

<sup>171</sup> Adelaide is a member - see <http://www.compactofmayors.org/>, viewed 4 February 2017.

<sup>172</sup> South Australia is a member - see <http://www.theclimategroup.org/what-we-do/programs/compact-of-states-and-regions/> viewed 4 February 2017.

<sup>173</sup> <http://www.energy-cities.eu/> viewed 4 February 2017.

<sup>174</sup> <http://bze.org.au/zero-carbon-communities/> viewed 4 February 2017.

<sup>175</sup> <http://www.bess.net.au/site/about/planning-system/>, viewed 4 February 2017.

<sup>176</sup> *ibid*

<sup>177</sup>

[http://www.portphillip.vic.gov.au/E39857\\_14\\_2\\_Environmentally\\_Efficient\\_Design\\_AC\\_Panel\\_Report.pdf](http://www.portphillip.vic.gov.au/E39857_14_2_Environmentally_Efficient_Design_AC_Panel_Report.pdf) viewed 4 February 2017.

environment benefits.<sup>178</sup> The Committee's decision included the following:

*Having considered the issues and submissions in detail and listened to expert evidence, the Committee has concluded that sustainability and sustainable development has a long history in planning; and that consideration of the issue has evolved to the point where many Councils are seeking to advance sustainable outcomes. The Committee considers that in principle, a Statewide approach is the best way to facilitate this increased focus on sustainability. In the interim the Committee is supporting the six Amendments and has recommended accordingly in this report. The Committee also notes, and comments on, the strong linkages between planning and building in the area of sustainability. The Committee has concluded that, whilst there should be improved clarity in roles, the two systems need not be in conflict and both have important roles to play.*

In Section 5.2 we noted that competitive federalism has, at least at times, played an important role in advancing policy and regulation in the built environment in Australia. Now it seems we can add a third leg to the stool – local government. In Victoria, the Council Alliance for a Sustainable Built Environment, CASBE, is helping the spread the SDAPP approach to more and more Councils. A new rating system – BESS, the Built Environment Sustainability Scorecard – has been developed to assist with this process.<sup>179</sup>

It is possible that local government's more immediate connections to local communities means that are, on the whole, more attuned to the community's desire to see stronger action on climate change abatement than are either state/territory or national governments. While action at the local level may seem piece-meal, there is also the phenomenon of critical mass: if 20% of councils – most likely representing a much higher share of Australia's population – are already committed to deep cuts in emissions – and many if not all are rolling out effective plans to do so, then over time the question will become one of, which areas are *not* targeting net zero? Competition and co-operation are both very strong within the local government community, as they have effective networks. With some Council's offering strong leadership, and others playing the role of fast followers, their leadership may go a long way to compensate for the lack of leadership at higher levels of government in Australia.

## Policy Processes and Governance

The previous sections have touched on key policy and regulatory governance processes in Australia. We can summarise them as:

- A tendency for major energy efficiency policies and measures to be managed jointly by states/territories and the Australian Government – this applies to at least the National Construction Code, MEPS/labelling, NABERS and NatHERS
- Leadership within these shared governance processes can rest with the Australian Government or with a particular state or territory
- COAG Energy Council is sometimes involved in policy decision making, but the Building Ministers Forum manages the National Construction Code outside this framework, and there is a lack of clarity – and have at times been tensions – between these bodies
- There is a lack of portfolio alignment between energy, climate change and buildings ministers between jurisdictions
- Decision-making tends towards a consensus, or at least large majority style, and is therefore slow
- The extent of industry involvement in key processes varies – there are five industry representatives on the Australian Building Codes Board, for example. In other major national programs too, a lack of appropriate separation of public policy and industry interests appears to be a concern – at least insofar as decision-making is concerned – consultation is a separate matter.
- A regulatory impact assessment process that, while ostensibly neutral in character, is in fact applied in an openly discriminatory way only to regulatory policies, and not to non-regulatory policies and decisions, regardless of the potential for the latter policies and decisions to impact negatively on welfare, competition or other outcomes; and which has acted – very effectively in recent years – as a 'gate-keeper' preventing regulatory proposals from even reaching decision makers.
- A regulatory offset process which, as noted earlier, has contributed to a virtual cessation of one of the longest-standing and most successful abatement measures in Australia – the minimum energy performance standards and labelling program.<sup>180</sup>

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<sup>178</sup> Ibid, and <file:///C:/Users/spr99/Downloads/CASBE%20planning%20information%20sheet%201%20-%20SDAPP%20at%20VCAT%20-%20Nov%202016.pdf>, viewed on 4 February 2017.

<sup>179</sup> <http://www.bess.net.au/site/about/planning-system/>, viewed on 4 February 2017.

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<sup>180</sup> We note that the most recent achievement report indicates considerable activity but no actual new regulations – see E3, *E3 Achievements: 2015-16*, available from [www.energyrating.gov.au](http://www.energyrating.gov.au), viewed 3 February 2017. New regulation impact assessments have, however, been issued in 2016, indicating the possibility of decisions being made in 2017.



An inherent problem with COAG or joint Commonwealth/State/Territory processes<sup>181</sup> is that there is a constant turnover of Ministers and Governments. With nine jurisdictions involved, and sometimes long caretaker periods ahead of elections, statistically, at least one jurisdiction risks to be in, or about to enter, care-taker mode at any given point in time, and this can frustrate consensus-based decision-making. Relatedly, political differences between participants in a joint governance process – including differing attitudes towards regulation and climate change in particular – can become very important when a consensus decision-making rule is applied. It only takes one to spoil a consensus. Arguably a lower standard of consensus (such as a simple majority) would reduce the ability of single jurisdictions to frustrate progress on national policy measures.

While questions of participative democracy are beyond the scope of this research, it is relevant to point out situations where governance arrangements are frustrating progress on important matters of national public interest, including the carbon and energy performance of the built environment. Modest changes in governance arrangements and rules could pay significant dividends in terms of enhanced welfare.

One opportunity would be to move to a lower standard of consensus for decision-making – such as 51%, or ‘all bar 2’, or another rules-based approach. A second would be to eliminate unnecessary governance arrangements. For example, we noted above the MEPS and labelling program is now delivered under national legislation but still involves consensus based decision making with the states and territories. From another perspective, the NABERS program was conceived and is managed by the NSW Government, even though a national program, but again involves governance arrangements that empower jurisdictions only tangentially involved in or committed to the program to impact on the speed and effectiveness of decision-making. In a similar way as occurred with the MEPS/labelling program, there may be an opportunity to consolidate building codes and regulations under a single piece of federal legislation. We note, however, that this would potentially weaken opportunities for competitive federalism, and place greater weighting on the character of the national government as the key determinant of progress with policy and regulation in this key area. At present, diversity of governance may be an advantage from this perspective, as discussed above.

Other aspects of good and indeed international best practice in policy and regulatory governance are touched on earlier in this report – with a key one being the frequency of updating of not only building code energy performance standards, but standards more generally. Code updates in Australia were annual, at least until 2010 – since then, as noted, the process has completely stalled. While annual changes may not be necessary, a rhythm of 3-yearly changes, as is at least

notionally the current case in Australia, would be in line with international best practice. We have to confront the reality that our governance of building code energy performance standards has fallen woefully short of this best practice benchmark; understand the reasons why; and at least be willing to posit potential remedies. Specific options are canvassed in Chapter 6 below.

#### Intergovernmental Collaboration

There are numerous examples of collaboration between national, state and territory and local government. At one level, there are financial transfers for many purposes, which reflect Australia’s vertical fiscal imbalance – most taxation revenue is collected by the Australian Government, but most public services are provided at sub-national level. Therefore there must be payments to enable the provision of these services. Another form of collaboration was noted under Section 5.1 above, where states and territories jointly deliver national initiatives including NABERS and MEPS. A degree of policy co-ordination is achieved through forums such as the COAG Energy Council, Building Ministers Forum and officials-level processes.

A new national initiative, *City Deals*, under the *Smart Cities Plan*, represents a new form of collaboration between the national government, state/territory governments and individual cities. The focus of the Plan to promote evidence-based, coordinated and integrated policy, planning and investment across all levels of government. The Plan also identified the need to explore further opportunities to improve the sustainability, quality and efficiency of buildings and precincts through standards and investments. City Deals are a mechanism agreed between the Commonwealth, a state or territory government, and local governments to improve outcomes in Australian cities. Through City Deals, all three tiers of government work together to articulate goals for a city or part of a city, and commit to the investment and policy reform needed to achieve these outcomes. Each City Deal will be tailored to local needs and set out the specific investment, planning, policy or regulatory changes needed to attract business and industry development and achieve the City Deal goals. The Townsville City Deal – Australia’s first – was signed by the Prime Minister, Premier of Queensland and Mayor of Townsville on 9 December 2016. City Deals for Launceston and Western Sydney are expected to be signed in 2017 with further City Deals developed over time. City Deals can provide opportunities for all governments to collaborate to demonstrate, pilot, test and evaluate innovative policies, regulatory approaches and technologies.

<sup>181</sup> The Australian Local Government Association is also a member of COAG.

## 6. Insights for Policy Design

This review of the international and policy landscapes, and consideration of the strengths and weaknesses of different policy approaches, enables us to draw some tentative conclusions for the design of policies and regulations for the energy/carbon performance of the built environment. We address below the key focus questions posed in the project brief, seeking answers that reflect the practices reviewed in Australia and elsewhere. In Chapter 7 we attempt to summarise the key features of an optimal policy framework for Australia.

*Focus question 1: What is the relative importance of regulation in driving low carbon outcomes in the built environment as compared to other policy levers such as public communication, marketing and financial incentives?*

In Chapter 3 we noted that there is an important role for information-based strategies. One aspect that drives poor carbon and energy performance outcomes in the built environment is a lack of information and knowledge about how to choose optimal solutions – building designs, materials, equipment – and how to achieve good outcomes over time – for example via appropriate maintenance and tuning of building systems. State governments in particular provide such information in a variety of formats – online, calculator tools, and, in some cases, advisory services.

We noted that, to be effective, information programs must be very well conceived and delivered to be effective. They must be tailored to very specific circumstances – based on a deep understanding of consumer/industry needs, of the timing of those needs, and of preferred communication media or platforms. They must understand the diversity that exists within their intended audiences – factors related to identity, preferences, age, culture, language and economic circumstances at least. They must be sensitive to context and sub-text – the way people understand language and its connotations, and not only what is the intention of the communication. They must be conceived of as information services, and not products – with the connotation that success is measured by the extent to which successful communication outcomes are achieved – and communication services delivered – and not the apparent quality of the information product.

These factors are well understood in the professional media industries, such as advertising and marketing. We noted, for example, the acceptance of the *17 Things/Liveability* model that was designed, delivered and continuously improved over a four-year period, in close consultation with its intended audiences – real estate agents and their clients – the consumer. Best practice aspects of this experience included clarity of purpose and objectives, extensive consultation, persistence (including following set-backs), appropriate and sustained resourcing, use of expert personnel and cutting-edge insights.

At the same time, we noted that non-regulatory information based strategies suffer from an inherent limitation which the Swinburne University of Technology summarised as, ‘you don’t know what you don’t know’. That is, unless the intended audience is already aware of the potential value of the information product to them, then they are unlikely to demand and utilise that product, regardless of how valuable it would be to them if they did. That is, there is a risk that information products will be used primarily by those who already possess a reasonable degree of knowledge and who are seeking confirmation that their knowledge is correct. Indeed this is an important outcome, as such confirmation may well assist them to commit to making a novel energy efficiency or low-carbon investment that otherwise they may have lacked the confidence to make. In this case, information needs are likely to be highly specific – a desire to compare the performance of alternatives available within the market, for example. The [energyrating.gov.au](http://energyrating.gov.au) resource, that enables consumers to look up a number of performance characteristics of appliances and equipment, is a good example of such an information service.

Reflecting the above, successful information-based strategies will be neither cheap nor rapid. A sustained effort will be required to understand and target critical information needs with appropriate information strategies; to deliver them in appropriate ways; and to track their success and refine approaches as needed. If this is not done, there is a risk that non-regulatory information-based strategies will be neither effective nor cost-effective. It is notable that, unlike for regulatory measures, there is very little independent, *ex-poste* evaluation of information-based strategies. The take-up of voluntary information-based strategies will always be uncertain in advance and, in the absence of effective *ex-poste* evaluations, we have little grounds for assuming they have been effective. Of course, such evaluations are difficult to do, and expensive, and yet their absence leaves us with at least no presumption that such strategies are more effective and cost-effective than regulation. At a minimum, this research remains to be done.

The voluntary basis of pure information services means that the impact of such measures is always likely be less than those leveraged by regulation. There are two sides to this equation. First, as discussed in Chapter 3, the party that holds information about energy- or carbon-performance may have no incentive to reveal it, and may indeed have a strong incentive to conceal it. This information asymmetry between the buyer and seller is very likely to lead to adverse selection, as buyers of poorly performing products are unlikely to be made aware of that performance until after the transaction is completed. Regulation can compel those holding such information to make it available, in a standardised and reliable format, thereby improving market outcomes. Also, it should be recalled that information products themselves typically involve strong returns to scale – that is, they involve a relatively modest upfront cost to create but then have very low or even zero marginal costs to supply to each additional

consumer, while the benefits of doing so will accumulate broadly in proportion to the number of consumers reached. This is why a purely private market in information services will be inefficient – each consumer would have to incur the full incremental cost of production, without the benefit of economies of scale.

The second effect of information services that are leveraged by regulation is that they can be forced to be provided at key points in a transaction chain – typically the point of sale, or before that point, when consumers are weighing up options. CBD certificates correctly must be provided when buildings or spaces are advertised for sale and lease, while disclosure of the rated performance of appliances and equipment via a website at least enables motivated buyers to access this information while alternatives are still being weighed. The author has long argued that in Australia, as in Europe, and as with buildings in the ACT, star ratings should be required to be disclosed in all advertising material as well, precisely to inform this critical stage in the consumer’s deliberation process.

In contrast to purely voluntary information strategies, we have hard evidence that those information-based strategies that are leveraged by regulation are highly effective and highly cost effective. The 2015 CBD evaluation, for example, concluded:<sup>182</sup>

*...the CBD program has been successful in inducing a change in the behaviour of building owners, operators and tenants in regards to commercial building energy efficiency. In particular, the buildings in the mandatory 4<sup>th</sup> quartile have achieved a marked improvement in NABERS star ratings and a significant reduction in energy intensity. There also appear to be improvements attained by the mandatory 1<sup>st</sup> and 3<sup>rd</sup> quartiles as a result of the program. These improvements have enabled the program to achieve benefits in excess of costs to date of \$44 million in present value terms, under a seven per cent real discount rate. If workforce productivity gains were taken into account then the benefits would be even greater.*

*The Benefit-Cost Ratio of the program in the ‘realistic scenario’ is calculated to be 2.58 with a corresponding Internal Rate of Return of 46 per cent. Worker productivity benefits are estimated to be approximately \$168m in present value terms*

Similarly, the 2015 GEMS (Greenhouse and Energy Minimum Standards) Review found:<sup>183</sup>

*Projections for the E3 Program in Australia, developed by the Department of Industry and Science (DoIS), show a Net Present Value in the range of \$3.3 - \$7.3 billion;*

*and a Benefit : Cost Ratio in the range of 1.7 – 5.2, over the period 2014-2020.*

It should be noted that Review attributes the majority of the savings to standards rather than labelling, although the split is not quantified.

Of course, the simple fact that an information product is leveraged by regulation does not guarantee its utility or success. It still needs to reflect the best practice design consideration noted above. As discussed earlier, the National Energy Efficient Buildings Project uncovered evidence that house energy ratings are not necessarily well-understood or viewed as credible by some stakeholders. We are unaware of a formal evaluation of NatHERS, although a review of its governance arrangements and operating model was undertaken in 2016. This made numerous recommendations for change, but did not attempt to quantify net benefits associated with the scheme.

In another example, while the CBD review found that scheme to be highly effective and cost effective overall, it also found that the tenancy lighting assessment (TLA) component of that scheme have been less effective to date, even though lighting is generally the largest energy cost for office tenants. We note that TLAs are not required to be disclosed in advertising regarding the sale or lease of an office, which limits their visibility and effectiveness. We also note that the TLA solution represented a compromise from the original proposal, which was to disclose tenant energy consumption (e.g., NABERS tenancy ratings). This was opposed strongly by building owners, who feared being held accountable for energy consumption they do not fully control. Policy short cuts are not always effective or cost effective.

Tenancy lighting consumption will generally be influenced strongly by owners decisions. The largest part of lighting costs for tenants – up to 100% in some cases – will be the efficiency of the ‘base building’ lighting solution installed by the owner. This is generally a minimally-Code compliant solution for a new office, and much less efficient for an older, unrefurbished one batters. Tenant decisions, which may include supplemental or task lighting, will generally have a much smaller impact. There is often a strong disincentive for tenants to replace standard lighting solutions with more energy efficient ones – even where they are directly responsible for paying the lighting energy costs – because most tenancy agreements require tenants to ‘make good’ the space on departure – and this means removing the efficient lighting system and reinstalling an inefficient one. While such clauses are sometimes waived by building owners, many tenants will be uncertain as to whether or not this might occur in their case – and therefore tolerate poor lighting systems installed by building owners, including the higher carbon emissions outcomes associated with these systems.

How does regulation compare with other strategies, including financial incentives? We noted in Chapter 3 that financial incentives take many forms and are difficult to assess overall. Setting aside taxes, subsidies and subsidised loans are, of course, voluntary and discretionary in their take-up, and in

<sup>182</sup> ACIL Allen (2015), p. 98.

<sup>183</sup> Databuild (2015), p. 9.

many ways mirror voluntary information schemes. By extension, subsidies as a form of information – a signal that someone has determined that there is extra social value associated with the subsidised item, and therefore consumers should pay attention to it and preference it in their decision-making. This theory of action is quite removed from that which is more generally assumed – that of economically-rational consumers weighing options and making carefully-calculated decisions – and for which there is supporting empirical evidence only in tightly controlled circumstances.

Also financial incentives very often suffer from limitations, the most significant of which is the free-rider effect. That is, governments offering subsidies generally will not know how many and which consumers would have purchased the item or service in question without subsidies (including loan subsidies). Therefore those consumers are likely to receive a subsidy as an unexpected – but generally welcome – gift. In social benefit cost analysis, that gift does not reduce the net social benefit of the measure, because it simply represents a transfer of wealth from government to consumers. However, the gift component of subsidies can dramatically increase the cost to government of the measure in question and, therefore, limit the willingness of governments to offer the subsidy in the first place, and therefore ensure that the public policy objective is not, in fact, met.

There are policy models that enable subsidies to be delivered with much less free riding. Competitive bidding – widely used in market transformation strategies – is one such approach. In this model, government indicates the social outcome it is willing to purchase – and sometimes (ideally) its budget constraint – and then conducts a request for proposal process, which may include a reverse auction element, to identify the least-cost solutions that deliver the social outcome. Provided such processes are properly specified, including to ensure that proposals deliver abatement additional to that which would otherwise have occurred, and evaluations of proposals are well-informed and evidence-based, then solutions with high free-riding will be weeded out as too costly and offering too little additional abatement. However, such processes do require additional administrative effort and cost upfront, in return for lower administrative costs and greater certainty of outcomes once tenders are awarded. In Australia at present, this model is perhaps best known through the ACT's reverse auction process for renewable energy supply, which has led to the lowest cost renewable energy in Australia.<sup>184</sup>

As with other forms of subsidy, but perhaps because the competitive bidding policy model is relatively new, at least in Australia, there are few formal evaluations of cost-effectiveness. That said, the results cited for the ACT scheme are likely to be shown to have been highly cost effective.

More conventional subsidies are rarely evaluated in the manner that regulations are.

From evaluations of regulations (of the energy- or carbon-performance of the built environment), we know that they are generally highly cost-effective as well as highly effective in achieving their public policy goals. So if we allow ourselves to be informed by evidence, we should have a presumption in favour of regulation, on effectiveness and cost effectiveness grounds alone.

*Focus question 2: Is there a strong linkage between regulation and the willingness of participants in the market to undertake innovation, e.g., suppliers of building products and technologies?*

Innovation is at the heart of the market transformation approach documented in Chapter 3, and with examples provided in Appendix A. A combination of policy instruments will be used to induce suppliers to bring to market, and consumers to purchase, products that offer superior energy or carbon performance and which were previously confined to niche markets, if available at all. In these models, economies of scale are critical, particular for emerging products where unit costs, and therefore prices, are likely to be high when sales volumes are low. For the supplier, a decision to scale up volumes involves significant costs and risks. If the extent of demand for the higher performance is highly uncertain, the expected value of this investment might be low, leading to the investment proposal being shelved. The product remains in its niche (where the relatively high prices of the smaller number of sales achieved may provide sufficient remuneration for the supplier to continue to operate at that niche scale) and, as a result, no market transformation for high performance outcomes occurs.

It is sometimes considered that Australian industry has a 'why bother?' attitude towards innovation due to our relatively small market size, distance from global markets, and history of trade protection (albeit that most tariff barriers have long since been dismantled). To this we might add low standards, and an absence of 'regulatory push', in addition to 'market pull', as described in Michael E. Porter's *The Competitive Advantage of Nations* (The Macmillan Press, 1990).

If policy or regulation is used to stimulate demand for high carbon performance, the prospect of a return on an innovation investment is higher. Such a policy could be fiscal in nature but, as noted, the consumer response to fiscal stimuli is also uncertain, particularly for low-volume and innovative products. However, where the quantitative uncertainty is removed, or at least lowered, this is likely to give the supplier the confidence to make the investment in the first place. Of course, competition between suppliers means that the prices paid by consumers for the higher performance product will be disciplined by market forces and therefore not excessive. This also implies that, as always, suppliers will still need to make sound commercial judgements about the relative attractiveness and competitiveness of their offering as compared to others that

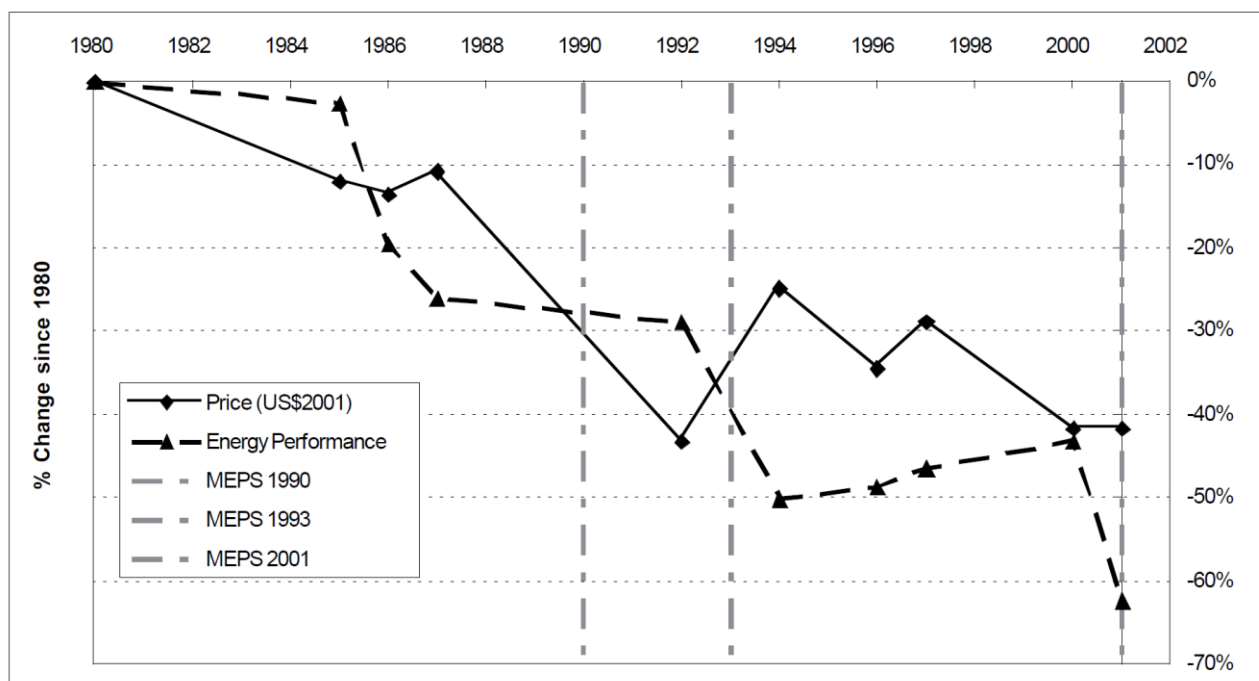
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<sup>184</sup> <http://www.environment.act.gov.au/energy/cleaner-energy/how-do-the-acts-renewable-energy-reverse-auctions-work> viewed 5 February 2017.

are in, or which are likely to enter, the market. Market transformation works with and leverages market forces.

What is the specific role of regulation in this process? It can be the instrument used to stimulate demand – and sales volume – for the high-performance products, but it is not the only choice. The US Department of Energy’s High Insulating Window Volume Purchase (WVP) Program, detailed in Appendix A, used a competitive bidding grant process to support manufacturers to invest in production requirement needed to manufacture triple glazed windows at competitive prices. In this case, the theory of action is to buy-down the unit cost of the high-performance product, and scale up the supply (and market familiarity) to the point where it may then be cost-effective to specify this higher performance standard in regulation. In countries with greater tolerance for strategic, as distinct from least short term cost, regulatory practices, the logic can be reversed.

**Figure 10: Relative average energy consumption and real prices, US refrigerators (Dale et al, 2002)**



An example is offered from the field of product energy efficiency standards. Alan Meier from the Lawrence Berkley National Laboratory has documented that:<sup>185</sup>

*In the United States, the average energy consumption of refrigerators and freezers decreased by 60 % between 1980 and 2001, while at the same time real consumer prices have fallen by 40 % (Figure 3) (Dale et al, 2002)*

<sup>185</sup> A. Meier et al, *Do energy efficient appliances cost more?*, published in the proceedings of the ECEEE 2007 Summer Study: Saving Energy – Just Do It!, pp 1127 – 1136.

[reproduced below]. *Minimum energy performance standards (MEPS) for residential refrigerators and freezers in the United States were first introduced in 1990, and subsequently updated in 1993 and 2001. Figure 3 shows that around the time when the 1993 and 2001 MEPS requirements were introduced, the average energy consumption dropped by approximately 20 % on each occasion. This strongly suggests that the majority of efficiency gains have been driven by the introduction of regulatory policies.*

The paper notes key explanation for these (and other similar) results, which highlight critical roles for regulation. Where high standards are set in regulations, this induces ‘learning-by-doing’ by manufacturers. This enables manufacturers to achieve the performance standard without additional costs or, at worst, with additional costs that are transient and quickly disappear. Meier et al noted:<sup>186</sup>

*Discussions with several of the leading whitegoods manufacturers confirm that in past years it has been*

*feasible to meet energy performance requirements at little or no additional cost. This is due to the following reasons:*

- *There has been sufficient advanced notice to meet the requirements through normal re-design processes.*
- *Manufacturers have been innovative in the ways in which energy performance has been improved.*
- *The costs of some components have fallen considerably.*

<sup>186</sup> Ibid, p. 1133.



*...At the time of an engineering analysis, energy efficient products have a low market share and command a high price premium compared to the conventional technology. By the time that further evaluation is undertaken, often after five or more years, the market for energy efficient products has grown considerably and the price reduced, converging with that of the conventional technology.*

Overall, the paper concludes that, at least in the case of energy efficient appliances, regulation led to:<sup>187</sup>

*Increased volumes of production, innovative design solutions and decreased cost of production.*

*Government regulations for energy efficiency have been successful in moving energy efficient products out of niche markets and into the mainstream. As volumes of manufacture have increased, the cost per unit of manufacture has fallen and this has generally been reflected in the price of products to consumers. In addition, there have been further production efficiencies which come from familiarity with new processes and technology, and the development of innovation.*

To answer the focus question above - Is there a strong linkage between regulation and the willingness of participants in the market to undertake innovation - we conclude that while regulation is not *essential* to market transformation processes – bulk purchasing and financial incentives can and are also be used, at least outside Australia – regulatory strategies are more likely to be successful than non-regulatory strategies due to their:

- Greater permanence than fiscal measures (which can be turned off overnight)
- Greater security and risk reduction for suppliers, as they are more strongly linked to total sales volumes than to unit sales prices
- Greater credibility, and less prospect of reversal, leading to investments in redesign and manufacturing capacity that in turn induce significant price reductions at the same time as achieving significant performance improvements.

Further we note that these conclusions are supported by decades-long experience and evidence in the product and appliance efficiency area, albeit that, in our knowledge, similar research has not been performed for buildings.

*Focus question 3: Are there policies and regulations which stand out for their effectiveness or otherwise?*

While the scope of this project has not permitted a fully quantitative answer to this question – based, for example, on meta-analysis of detailed policy and program evaluations –

there is sufficient evidence in the literature reviewed in this project to offer at least tentative conclusions.

Building energy performance codes stand out not only for their cost effectiveness but also for their effectiveness over time. Noting that most codes apply only to new building work – which generally includes renovations as well as new construction – Codes are sometimes dismissed as having little impact on the overall building stock. But this may be a good example of what behavioural economists call ‘hyperbolic discounting’ – a cognitive bias in which many people tend to heavily discount the future. An analysis of hyperbolic discounting in a financial industry context notes that it ‘...presents enormous risks’ – because all we see clearly is the past, we tend to underestimate the extent to which change can occur over time.<sup>188</sup> In fact, because cities are in constant state of renewal, the area affected by Codes every year at least includes all new buildings, all renovated buildings (subject to Code application thresholds) and all demolished and replaced buildings. Over time, this area increased at a geometric rate, at least where there is net growth in the building stock, as is generally the case.

The second reason why codes are highly effective is that their unit energy savings, or stringency, is generally significantly higher than that induced by other measures. So each investment that occurs (including as the building stock turns over) achieves greater savings than would other measures.

Third, the fact that codes generally apply to new building work offers the great advantage that the performance requirements can be met primarily through low-cost design changes and not add-on costs, which will be the case with building retrofits. This effect was documented in Meier et al (2007) in the appliance regulation field, but it has also been documented in Australian buildings. A 2012 Report by Sustainability House noted:<sup>189</sup>

*Current popular designs as constructed by Australia's largest volume builders can meet the 6 star energy efficiency standard with reduced construction cost if the design is modified to best suit the climate and orientation rather than increasing the building specifications, e.g. insulation levels. Results of this study show an average increase in energy efficiency of 1 star, and an average decrease in total construction cost of nearly 2%, compared to the original design.*

Second, and while a newer policy model with therefore lesser quantitative evidence in its corner, mandatory disclosure of building energy performance stands out due to its market-enabling characteristics, potential application to the whole building stock, and not only new builds, together with early

<sup>188</sup> <http://ww2.cfo.com/forecasting/2014/05/10-cognitive-biases-can-trip-finance/>, viewed 5 February 2017.

<sup>189</sup> Sustainability House, *Identifying Cost Savings through Building Redesign for Achieving Residential Building Energy Efficiency Standards*, March 2012, p. 11.

<sup>187</sup> Ibid, p. 1133.

evidence of cost effectiveness, as for example noted in the 2015 review of CBD. Our assessment is that there is much greater potential for this policy measure in Australia than is currently being realised. As set out in Chapter 3, voluntary disclosure initiatives are a poor substitute for mandatory disclosure and are likely to be much less effective.

Third, market transformation stands out for its ability – probably greater than the other policy measure noted above – to change the game on energy and carbon efficiency. This is because, by working with market forces, and understanding them as dynamic forces and not something fixed and immutable, it is able to stimulate innovation, investment and competition and drive down the costs of high performance equipment, stimulating demand and permanently shifting the centre of gravity of market outcomes towards high energy- and carbon-performance.

*Focus question 4: Are there interesting policy and regulatory experiments in comparable countries which Australia should consider?*

Yes. When compared to other countries, Australia limits itself to a narrow range of policy types. Whether this reflects the tyranny of distance and our relative isolation from countries adopting more innovative models, a lack of time and budgets spent on researching global best practices, or the conservative bias noted in our review of regulation impact assessment and ‘best practice’ guidelines, which default to an assumption that the status quo is preferred to intervention, or a combination of all three, is unclear.

The US experience with market transformation has been extremely impressive, with high-performance glazing and lighting at least benefiting from this approach. In Australia, glazing is of a very low standard, with 4mm single pane glass and aluminium frames without insulation or thermal breaks. Such solutions would be unsaleable in most OECD markets because:

1. it would fall below Code requirements
2. it would not be less expensive than high-performance glazing, as it would require a one-off special order to a window supplier – their markets and production processes have long since moved on
3. consumers in those countries have learned that high-performance glazing is a superior solution – if offers greatly enhanced comfort, noise abatement and also lower household/building running costs.

As noted, successful market transformation would – with effective governance processes as described above, feed back into improved regulatory settings, by changing the cost effectiveness equation for high performance. This in turn would feedback into greater market volumes, economies of scale and lower prices.

*Focus question 5: Are there ways of structuring regulations so as to maximise the prospects of compliance?*

Yes. The critical change required in Australia is to set building performance regulations on a measurable, outcomes basis, creating transparency for all parties – most importantly, for the building owner – which is verifiable and in fact verified post-construction. Very tentative steps are being made in this direction by exploring whether NABERS ratings tools and commitment agreements could become a Code compliance pathway – but, of course, only for offices due to limitations in the range of NABERS tools.

Second, by requiring continuous (annual) mandatory disclosure – using the same performance metrics and ratings tools as used to demonstrate compliance with the Code – peer and consumer pressure will help to ensure that Code requirements are met. In Europe, buildings are required to prominently display their building energy performance ratings.

Third, regulators need to do their job. It is unprofessional and unacceptable in any field for regulations – that is, the law – to be administered without verifying compliance. Can we imagine such an outcome for health and safety regulation in hospitals, or for road rules? The view that energy performance requirements represent a second-order objective in the National Construction Code, although often advanced, is not reflected in the Code itself. As noted earlier, this view is implied in Clause 4.1 of the 2012 Inter-Governmental Agreement, but this document is not legally binding, and in any case the clause relates to mission of the Australian Building Codes Board: it does not in any way change the legal responsibilities of Code administrators in the states and territories.

*Focus question 6/7: How might the speed and efficiency of the regulatory design process itself be optimised; in particular, how important is it to a speed and efficient regulatory design process that there be a clear vision for the built environment of the future? Can regulations be made more adaptable to changing circumstances in the future (e.g., through incorporating elements of automaticity in regulations)?*

The speed and efficiency of the regulatory design process could be optimised in numerous ways, including:

1. Achieving clarity about specific regulatory objectives which, once agreed, are not subject to re-establishing with every incremental regulatory change
2. Ensuring that the regulation impact assessment process is not managed with the intention of preventing regulation that is in the public interest
3. Agreeing a rules-based approach to keeping standards current and relevant through time, and minimising the degree of non-transparent discretion in the process
4. Empowering an independent and expert body to oversee the regulation development and assessment process.

5. Reviewing and reforming governance arrangements, to maximise consistency of intent and to co-ordinate activity.

The lack of precision in the framing of the energy performance objective of the National Construction Code, and a lack of consistency in the way this objective is applied is discussed above in Section 5.1. The objective should be framed in a manner that is readily quantifiable, in addition to being 'sufficient' to the longer-term objective of climate stabilisation. A clear pathway based on a simple metric, like MJ/m<sup>2</sup>.a, would be highly desirable. We note that the specification by the ABCB (in the documentation that accompanied the development of technical standards for the stringency review of Section J, issued late in 2016) that stringencies should, inter alia, deliver a benefit cost ratio of between 1 and 1.5, is an important step in this direction. It also specifies that performance requirements be expressed in consistent metrics – MJ/m<sup>2</sup>.a.

The gate-keeping role of regulation impact assessment has also been described in Chapter 3 above. As noted by stakeholders, this has had the effect of turning what in principle represents good regulatory practice and hygiene into a deliberate process of frustration of good policy design, distorting the choice of policies to models that are not subject to regulation impact assessment and which are often less efficient and more distortive than performance-based regulation.

A rules-based approach to regulation – similar to the EU's cost optimisation process for the Energy Performance of Buildings Directive (see Appendix A) – is vitally important. We noted that international best practice centres on Code updates around every three years. We have therefore to confront the reality that the governance of our building code energy performance standards has fallen woefully short of this best practice benchmark. How would a rules-based approach improve the current situation?

First, the rules and methodology to be applied during a regulatory review, including the frequency of the review, would be carefully documented and, following careful review and consultation, adopted into law. This review and documentation would already be a major advance for Australia for, as noted earlier, there is a lack of precision in the wording of the Code's objectives that makes it unclear what stringencies should be applied.

Second, a suitably expert body would be charged, via legislation, with applying the rules at the agreed frequency, say every three years. Best practice globally extends to such an approach. In the United States, the Pacific Northwest National Laboratory (PNNL) undertakes this role both nationally and for US states, and it has developed an efficient and rigorous process for doing so. It also conducts and applies contemporary building science research and knowledge of innovation in construction materials, processes and designs to ensure that Codes and stringencies remain relevant. Factors such as building/element costs, energy prices, values for external costs, climate projections, etc.,

would be updated and a new stringency proposed – both the next stringency step and an updated indicative pathway for future Code Stringencies. The statutory body would also apply an agreed RIS methodology which, as now, would extend to establishing that there is an ongoing need for regulation, and assessing whether or not there would be more cost effective ways to achieve the public policy objective. As noted, it would be important that no 'gate-keeper' body stood in the way of an agreed methodology, once adopted into legislation. However, a body such as OBPR could provide an independent review of the RIS, with both the RIS and the review to be published to ensure due process and external scrutiny.

Third, the proposed stringency change (and any other proposed changes emerging from the process) would undergo consultation, as now, before decision-making by a suitable body, such as COAG Energy Council. Enabling legislation should establish an expectation that the results of this agreed process would be implemented unless it can be demonstrated that it has failed some important aspect of the Regulation Impact Assessment process.

Indeed, given that the same high degree of discretion in the regulation-making process has also led to significant disruption in the product minimum energy performance standards and labelling area, the same rules-based approach should be applied in this area. In both cases, this rules-based approach would have the considerable advantage of providing certainty and predictability of future standards, as, first, the subsequent stringency level would always be foreshadowed and, second, any party would be able to replicate the statutory methodology and formulate their own view about expected future stringencies. Critical to this process, and consistent with our findings about international best practice (Chapter 4), would be the credibility and consistency of application of the statutory rules – that is, an absence of discretionary intervention.

With respect to governance, the experience of the last decade calls for an independent review of the governance of the full suite of national policy measures noted above, including to ensure alignment and consistency in approach and indeed timing. At present, the timing of consideration of possible changes in ratings tools – including NatHERS which is used for regulatory compliance, but also potentially in future NABERS, which could also be used for this purpose – is poorly aligned with and fails to anticipate the needs of building regulation. In many cases, different bodies are involved in the processes, with inadequate formal connections between them. Such a disciplined and rules based approach would also enable standards reviews, technical research and policy/methodology review that may be needed from time to time, to be scheduled appropriately and integrated into a highly functional and effective system.

The second element of the focus question asks, how important is it to a speed and efficient regulatory design process that there be a clear vision for the built environment of the future?

The answer to this is nuanced, as the story of the unsuccessful ‘pathway’ initiative in 2011 – 12, recounted in Section 2.3 above, indicates that there is no guarantee that such a process will succeed. We have lived experience of it failing. Einstein reminded us that ‘Insanity is doing the same thing over and over again and expecting different results’, but of course he was referring the physical sciences, where predictability of outcomes is ensured by tight control of system conditions; in political sciences, no such control exists and his rule may be broken.

The logic of the pathway approach is fully consistent with international best practice – as highlighted in the Danish case study in Appendix A. This logic is that by creating clear and evidence-based expectations about not only the next, but perhaps the subsequent one or two, Code changes, industry and suppliers can time their investments in innovation appropriately, anticipate future needs, evolve designs and building systems in a timely manner, and generally ensure that the pathway is achieved at least cost over time. Another key advantage, highlighted by Denmark, is that – provided ratings tools and regulatory compliance tools are suitably integrated, or at least aligned – companies can choose to build to ‘future standards’ if they perceive economic or reputational advantage in doing so.

However, the very transparency and extended stakeholder engagement of the pathway development process saw that attempt undermined by industry stakeholders<sup>190</sup>; governments unable to reach agreement; and a regulatory process and timeline that lacked structure, drive and discipline. We should be prepared to learn from this experience. We would argue that the answer lies in a four-step process:

1. Create the evidence-base with which to determine realistic and necessary public policy objectives (step 2) and code stringencies (step 3). This is likely to involve first creating or empowering an expert and independent statutory body to compile the relevant scientific, economic and technological evidence, and to prepare for structured engagements in the steps below.

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<sup>190</sup> Objective motivations for industry opposition to building energy performance standards are hard to find. While industry expresses concern about rising costs and affordability, particularly for houses, the contribution of energy performance to overall building costs is trivial, and increasingly so through time, noting the growing influence of land prices in new housing costs – see <http://www.afr.com/real-estate/house-prices-defy-predictions-in-2016-by-rising-more-than-10-pc-20170102-gtkma7>, for example. These results were achieved at a time when energy performance standards have been static and demonstrably not contributing to cost outcomes. Also, the costs in question are not incurred by the building industry, but rather by building owners, who also benefit (and to a greater degree) from the performance regulation.

2. Establishing very clear and operationable Code objectives, supported by transparent metrics that are capable of being verified pre- and post-construction. As with other steps below, this process must involve direct and in-depth engagement with a wide range of stakeholders in the public policy outcome, and not only industry associations, but must be an evidence- and science-based approach. Stakeholder concerns, no matter how passionately expressed, must be subject to a due process of scrutiny, with the results of this analysis made transparent.
3. Set a rules-based approach for Code stringency changes into legislation as a process, not an outcome. In this way, the rules and timelines are transparent for all parties, but the possibility of stalling the process in non-transparent and political ways would be disciplined. The rules themselves must be set via a highly consultative process, but with clarity about and commitment to advancing the public policy objectives (see Step 2 above) and drawing on a credible body of evidence (Step 1).
4. Apply the rules via the independent and expert body, adopting a high degree of transparency and evidence, while following the highly consultative process documented in Step 3. Models, modelling assumptions and modelling techniques should all be in the public domain and open to challenge. Expert forums, including online, should be encouraged to challenge values and methodologies, leading to refinement and continuous improvement over time. All advice to government must be published along with a detailed statement of reasons. The expert body would be required to produce a RIS, and that RIS should be reviewed by a suitable body, such as the OBPR, within statutory timelines (e.g., 30 days). The result of such a review must also be published.

Overall this approach is based on clarity, transparency, evidence, discipline and due process. While in a democracy, the end result of the process must be agreed by Ministers, the experience of Australia’s immediate past indicates that significant change from past practices is required if we are to achieve outcomes that are demonstrably in the public interest.

*Focus question 8: What does the survey of the Australian and international landscapes suggest should be the priorities, or included, in Australia’s National Energy Productivity Plan (NEPP) in terms of maximum impact?*

Vision, ambition and leadership are the essential ingredients in national strategies such as the NEPP.

Without a clear sense of the outcomes that must be achieved, and a commitment to work towards outcomes that are articulated and agreed as necessary and important, then a catalogue of processes is just, as the NEPP is described, a work plan. A work plan is an excellent thing, but to what

end? If the answer is, a 40% increase in energy productivity – a figure what many assume will fall comfortably into the business-as-usual range, due primarily to economic and technological progress, and which is silent on carbon emissions – then this amounts to an entirely inadequate response to the serious public policy challenges confronting Australia’s built environment. Such a productivity target could be achieved at the same time that emissions climb well above levels that are sustainable, or even above targets currently committed to in international processes. Such a target could be achieved while overseeing the development of a building stock that may not adequately protect occupants from the more severe climate conditions of the future.

As noted earlier, the carbon budget approach and international authorities cited in this report agree that we must be striving for the entire building stock to achieve carbon neutrality, or be carbon positive, in not much more than a decade. This demands an approach to policy that is outcomes-driven and not incremental, seeking minimum-necessary changes.

In terms of priority, and consistent with our earlier analysis, #31 Advancing the National Construction Code is the most important priority – provided, as above, that this work program is executed with a clear outcome in mind. This is of course for governments to determine.

Second, items #5 and #9 – that could conceivably expand the scope of mandatory disclosure to all building classes (as was agreed in 2004!) – should be prioritised with, as above, a clear statement from COAG about expected and necessary outcomes. The role of bureaucrats should then be to find the most efficient and effective solutions in a timely manner. While soever there is no political direction, the bureaucracy is unlikely to produce innovative or ambitious results. Governments must take the first step in signalling their willingness to at least consider innovative and ambitious options.

*Focus question 9: What does the survey suggest may be the gaps in the NEPP, or other areas of policy or regulation which should be addressed in future if, for example, Australia were challenged to strive for higher targets in carbon reduction?*

As noted, there are many areas where very substantial and additional results could be achieved from broadly the existing set of policy measures and approaches – the building code, mandatory disclosure, appliance regulation and labelling, ratings tools and others. What is required is an approach that seeks outcomes from these policy measures that are a) commensurate with achieving a sustainable and evidence-based pathway towards the long term goals of the Paris Climate Agreement – zero net emissions – and b) represent a least-cost pathway to that outcome over time, based on a rigorous and evidence-based process of policy instrument selection.

That said, there are opportunities to work with new and additional policy and regulatory options which, while proven overseas, are not yet deployed in Australia. Top of the priority and opportunity list is market transformation, for the reasons noted earlier. This powerful, market-based solution could be implemented quickly, lead to significant economic benefits for consumers, lead the creation of a more innovative and globally competitive building products and building industry in Australia, at the same time as dramatically reducing emissions.

We have noted previously that not all product (or service) markets will be suitable for market transformation. Selecting optimal opportunities for market transformation would require evidence based analysis by an expert and independent body, which could draw on extensive international experience to assist its work.

Second, we noted in Chapters 3 and 5 that while a past *Prime Minister’s Task Force on Energy Efficiency* recommended a national energy efficiency target, supported by a national Energy Savings Initiative (ESI), or enabling scheme, neither outcome has yet been achieved. Item #2 in the National Energy Productivity Plan refers to ‘market mechanisms to capture societal benefits’, which it lists as the Emissions Reduction Fund, state energy efficiency schemes and the renewable energy target. The work plan notes that ‘Work will be considered to align activities and reduce red tape where appropriate, while ensuring that schemes continue to deliver the high-quality outcomes that consumers expect.’<sup>191</sup> Possibly this work could extend to reconsidering the case for a national energy efficiency target and ESI. If such an outcome could be agreed, it is likely that states would agree to merge their existing schemes into ESI. However, due to its national scope, its potential to contribute to market transformation and large scale, cost effective abatement, would be larger than that being achieved by current state-based schemes.

*Focus question 10: Is there excessive or poor policy or regulation which is inhibiting low carbon outcomes?*

There is little doubt that poor quality regulation – in the sense of regulations that lack ambition, that are infrequently updated, where stringency is not optimised on the basis of evidence, where gate-keeping processes prevent regulatory proposals from coming forward for decision making – is a major constraint on economic and carbon outcomes in the built environment in Australia. This is not a problem of poor regulation but rather of poor governance of regulatory and policy processes. Similarly, we have noted that many national policy measures have unnecessarily narrow scope.

Perhaps the final judgement on the adequacy of the current policy mix is that, since the removal of carbon price, and

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<sup>191</sup> Australian Government/COAG Energy Council, *National Energy Productivity Plan 2015 – 2030*, December 2015, p. 19.



despite the presence of these measures, greenhouse gas emissions in Australia have been rising.

We have identified that there are numerous opportunities to improve the impact and performance of policy and regulatory measures for carbon and energy performance in the built environment. To recap, these include:

- A significant lift in the stringency of building energy performance requirements in the National Construction Code, for all building classes, in 2019 at the latest
- In parallel with this process, design and implement a new rules-based approach to standard setting that could apply for subsequent regulatory resets
- Expand mandatory disclosure to every building class, including developing a simplified and lower cost disclosure protocol
- Expansion and updating of ratings tools, including ex-poste tools such as NABERS, to cover all building types and energy end uses
- A major review and overhaul of policy governance processes for all national policy measures, to ensure that they are aligned, co-ordinated, effective, efficient and not subject to conflicts of interest
- Setting a national energy savings target and National Energy Savings Initiative to ensure the target is met
- Creation of necessary support measures, including empowering an independent and expert statutory body with the development of codes and standards and preparation of regulatory proposals, in line with an agreed and statutory process. Support measures for such a body would include ensuring that there is adequate data capture and disclosure to enable effective research and policy development; appropriate, hypothecated funding; and governance arrangements that are entirely independent of government and of the industries being regulated.

Subject to such national leadership, it is likely that other jurisdictions would agree to change their own policy settings, to assist with an overall optimisation process. This could lead to reductions in compliance and related costs for industry.

## 7. Towards Optimal Policy and Regulation for Australia

This final chapter offers – as a thought experiment, but based on our review of national and international policy and regulatory practices – a possible ideal suite of policies and regulations for optimal carbon performance of Australia’s built environment over time. The purpose of this experiment is to stimulate debate and discussion about the relative merits of key elements of this policy approach, and to help consider pathways for moving towards best practices over time.

We begin this chapter with a summary review of the extent to which Australian policy and regulatory practice in the built environment reaches or sets international best practice, and the areas where we appear to be furthest from this benchmark. We then consider the key or ‘mega’ trends that are shaping the context in which such policies and regulations will operate. Increasingly, Australia’s policy settings appear to be falling behind the pace of market and technologies development, suggesting that policy development and governance processes are wanting, including in intersecting policy domains such as the National Energy Market. We then identify possible national, state/territory and local elements of a best practice policy and regulatory framework, before concluding with some observations about a potential way forward.

### Australian and Best International Policy Practice – A Critical Assessment

Overall, our comparison of Australian and best international policy and regulatory practice indicates that Australia falls short of international best practices in most, but certainly not all, domains of building energy/ carbon performance.

Our best practices include:

- *Ex poste* rating of (some) building forms via NABERS (best practice because actual building performance, rather than design performance, is assessed, and because the scheme has high auditing and accreditation integrity)
- Mandatory disclosure, limited to larger and dedicated offices, and to housing in the ACT (best practice because it informs market choice based on actual energy performance)
- Voluntary certification of premium buildings via Green Star (best practice because it has achieved strong recognition and take-up at the premium end of the commercial building market, notably in central business districts)
- Government procurement schemes for energy efficient offices (best practice because they create a market pull for higher performance) – albeit that these are set at modest levels and infrequently updated

- Some states, territories and an increasing number of local governments are contracting for high shares (up to 100%) of renewable electricity (best practice because it recognises the need to transition towards carbon neutrality, and not merely to make incremental savings)
- Larger white certificates schemes at state/territory, such as the NSW Energy Saver Scheme (best practice in that energy savings are mandated and where more cost-effective, project-based solutions are permitted)
- Some local governments effectively set above-minimum standards through planning schemes, and increasingly are contracting for the supply of 100% renewable energy
- Excellent reporting practices and governance arrangements in major property trusts, which underpins Australia and New Zealand’s leading GRESB score.<sup>192</sup>

Our worse practices include:

- Low energy performance standards, including a failure to set ambitious targets for building energy/carbon performance in the National Construction Code – instead, standards are set on a ‘minimum necessary’ basis, while above-minimum standards at sub-national level are actively, if not always successfully, discouraged. Best practices involve setting the highest cost-effective standards, while at the same time using market transformation strategies to encourage innovation and thereby to improve the cost effectiveness of

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<sup>192</sup> Much is made of Australia’s (and New Zealand’s) top ranking on the international Global Real Estate Sustainability Benchmark. The 2016 Snapshot for the region notes “...an unbroken streak of global leadership despite increasing competition from peers around the world”. However, it is important to understand this tool benchmarks *processes* – such as corporate policies, target setting, due diligence, risk assessment, data management, reporting practices, offsets, stakeholder engagement and external review. Quantitative indicators (such as change in energy, carbon emissions, water, waste) reflect the year-on-year change in totals of the particular and leading property trusts that participate in the GRESB process. While these results are to be celebrated, they indicate primarily that Australia’s leading property trusts – whose portfolios comprise most premium office and retail assets – have excellent governance practices. Secondly they indicate that the portfolios of these trusts are consuming less energy and water, and producing less emissions and waste, from year to year. GRESB does not attempt to compare the performance of these portfolios, let alone of the wider building stock in Australia, on an intensity basis relative to global best practices. The results should therefore not be interpreted as conveying any information about the energy or carbon performance of the wider Australian building stock.

even higher standards in future. European and many Asian nations are setting the benchmarks in this domain.

- Infrequent, unpredictable and discretionary reviews of (and possible upgrades to) whole building and building component energy performance and labelling requirements, including the lack of an agreed, objective and independent process for Code/standards stringency setting over time. Best practices involve predictable, regular, transparent and rules-based policy processes, with clear policy objectives and limited discretion, as per Europe's cost optimisation process and, to a slightly lesser degree, in the United States via their network of national laboratories.
- The absence of a long-term trajectory for energy performance standards for buildings, and of incentives, that would ensure that energy and carbon outcomes are *sufficient* to achieve required national goals (not only carbon abatement, but also ensuring occupant health and safety in a more extreme climate). Best practices – as modelled in Denmark, for example, where a pathway for 75% improvement over 15 years was mapped – involve creating and delivering on such trajectories because they deliver investment certainty, encourage innovation, and limit discretionary interventions in the decision-making process.
- The absence of incentives at a national level<sup>193</sup> for over-achievement of minimum standards. Best practices encourage carbon neutral or carbon positive buildings even in the short term, as this recognises that over-achievement of minimum standards is necessary helps achieve a transformation in the carbon performance of the whole building stock by mid-Century, and because which buildings have a demonstration and demand pull effect which drives innovation and market transformation.
- A lack of incentives for retrofit of the energy/carbon performance of the existing building stock. Best practices include Germany's CO2-Rehabilitation and Efficiency House 100 programs, which offer government-backed loan financing, grants, and tax rebates through retail banks, that are contingent upon reaching a rated performance level and which feature tiered incentives, where the higher the resulting efficiency the more generous the associated loan and/or grant; or Energy Spring program in the Netherlands, UK and elsewhere, which has already seen over 100,000 houses retrofitted to zero carbon performance levels; or

New York's *Greener, Greater Buildings Plan* that requires building owners and operators (of buildings greater than 50,000 square feet (4,645m<sup>2</sup>)) to benchmark their energy use annually, conduct energy audits and retro-commissioning once every 10 years, and install sub-meters and upgrade lighting in non-residential buildings by 2025.

- Poor attention to Code compliance and to quality assurance for related functions such as energy assessment. Performance requirements are set on an as-designed basis with no as-built verification, while there is a lack of regular and statistically significant compliance auditing. Most Australian jurisdictions allow unaccredited energy performance and other building practitioners, encouraging adverse selection, while widespread criticisms of key elements of the buildings policy framework have not lead to remedial action by jurisdictions. As noted, NABERS – a voluntary program – sets the benchmark for quality assurance and evidence-based results in Australia. Best practices are evidenced in New York, where the *Retrofit Accelerator* provides assistance to help building owners to comply with mandatory energy audit and retro-commissioning laws), implement upgrade projects and monitor results.
- Very limited application of mandatory disclosure of building energy performance. Best practices involve universal or near-universal coverage of building types, as in the whole of Europe, and as was originally intended by the Australian Government in 2004.<sup>194</sup>
- Limited investment in buildings and buildings policy research and development, including ratings tools (noting that one additional NABERS tool is under development). The absence of suitable ratings tools is one explanation for the limited coverage of mandatory disclosure in Australia. Best practices are evidenced in the United States, where ongoing and largely independent institutions, such as the Pacific Northwest National Laboratory, maintain the necessary expertise and investment for ongoing Code and ratings tool development.
- An absence of market transformation initiatives or technology policies that consciously aim to improve the availability and cost-effectiveness of high energy/carbon performance equipment and building elements.<sup>195</sup> Best practices are found in United States, Japan and Europe where market transformation initiatives are regularly implemented, including in high-performance glazing, lighting and air conditioning.

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<sup>193</sup> The Energy Saver Scheme in NSW rewards buildings for improving by at least 1 NABERS star. In principle the Australian Government's Emissions Reduction Fund could also cover a similar action, but there is no evidence to suggest this is occurring in fact.

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<sup>194</sup> Although we note that disclosure in Europe can be based on estimated, rather than verified, performance.

<sup>195</sup> Australia's partial phase out of incandescent lighting from 2009 represents the only known example.

- Inconsistent policy processes and settings, such as regulatory impact assessment and offsetting requirements, that have – until recently – effectively halted the development of new building and building product performance standards (*inter alia*). Best practices include Japan’s 3-yearly TopRunner standards upgrade cycle, and the European Union’s Cost Optimisation process which provides a rigorous, transparent and rules-based approach for standard setting.
- Limited education and awareness raising for the general public or the building industry regarding energy/carbon performance. Best practices are evident in Europe and in parts of the United States, where extensive outreach and extension services are offered to industry at least.

As cited in this study, there has been a series of reports offering critical analyses of policy and regulations in Australia’s built environment in recent years, and extensive recommendations for reform. These have included the *National Energy Efficient Buildings Project Phase 1 Report*, in addition to the earlier *National Building Energy Standard-Setting, Assessment and Rating Framework*, which represented a comprehensive effort to reframe buildings policy in Australia. The fact that the latter exercise was never concluded, and no public explanation offered for its termination; the absence of any official government response to the 47 recommendations of the former one; along with the negative response to the earlier *Prime Minister’s Task Group on Energy Efficiency*, suggests there has for a long time now been little appetite for reform of buildings policy in Australia. Whether the current National Energy Productivity Plan or the 2017 Climate Policy Review will engender such an appetite remains to be seen.

## Megatrends

The summary critique of Australian relative to international best practices in policy and regulation of the carbon and energy performance of the built environment highlights key opportunities for reform, along with the broad shape of an optimised suite of policies and measures. However, before offering an optimised policy set, it is important to be clear about the contemporary challenges and opportunities that are expected to shape the environment in which this policy framework will operate.

### Climate change and ambient conditions

A key challenge for the built environment is climate change. The central predictions of anthropogenic climate change include an increasing frequency and severity of extreme climate events – including storms, flooding wildfire, storm-surges in coastal and riverine areas – along with important background changes in indicators such as average temperatures, overnight temperatures, sea-level and others. These conditions will represent a growing threat to human and ecosystem safety, in addition to requiring additional

expenditure on energy to maintain safe and comfortable living conditions.

At the same time, our rising population and increasing urbanisation means that more and more Australians are and will be living in higher density urban situations, where issues such as protection from ambient noise, air pollution and the urban heat island effect – the accumulation of heat in the urban environment due to albedo, thermal mass and heat rejection effects – will become increasingly important for comfort, safety and amenity, in addition to influencing the demand for energy consumption and, potentially, greenhouse gas emissions.

It seems axiomatic that since we build buildings primarily to provide shelter from ambient conditions, and since buildings have long economic lives of 40 years or much more in some cases, the character of those expected future ambient conditions should be a key driver of our building design and construction requirements. In fact, ratings and modelling tools that are used to demonstrate Code compliance use historical climate files that do not take climate change into account. As a society, we are therefore spending billions of dollars every year to build designs that are optimised (at best) for a past climate, without considering the extent to which these investments will be robust and appropriate in the face of expected climate change. The cost of retrofitting these buildings in future may be very high, as retrofitted performance increments – other than through renewable energy, as discussed below – cost many times more than performance increments that are designed- and built-in at the start.

A key criterion, then, for sensible policy design in the built environment is to fully accept and integrate the science of climate change into buildings (and planning) policy. Practically, and in addition to planning considerations such as greater set-backs from the coast and from fire- or erosion-susceptible land, this will mean designing and constructing buildings that have greater thermal integrity than in Australia’s past, including much greater attention to solar passive design principles including appropriate orientation of subdivisions, blocks and individual buildings; higher levels of insulation; reduced heat conductivity in glazing and thermal bridges; improved shading; improved utilisation of thermal mass; and improved air-tightness.

The latter requirement, along with need to provide for appropriate levels of ventilation, including in the context of a more severe climate, indicates that heat recovery ventilation will become a key feature of Australian buildings, as it is for buildings built to the international passivhaus standard. It will be important to recognise that this represents a paradigm-shift for the Australian building industry. The majority of building professionals in Australia have been trained to build, or at least tolerate, leaky buildings, and particularly homes, on the explicit or implicit assumption that this is an effective strategy for achieving ventilation. Unlike in most other countries, Australia has no air-tightness performance requirements in the National Construction Code, while for residential buildings the default assumption is

that adequate ventilation can be assured simply by the ensuring that a certain percentage of facades is “openable”, e.g., windows and doors. This ignores the reality that many people choose, or live in locations where they deem it necessary, not to open windows and doors. As a result, it is likely that these houses may be dangerously under-ventilated.

It will also be necessary to educate home owners about this new paradigm. There are numerous misconceptions about ventilation and heat recovery, including those perpetuated by poorly informed building professionals. The most common myth is that houses will need to be shut up tight all year round if mechanical ventilation is installed, but this is incorrect. The operating paradigm will be that in mild conditions, regardless of the season – and in many parts of Australia, that is for most of the year – houses can be naturally ventilated (and commercial buildings may use passive or hybrid ventilation strategies). However, during more extreme conditions (heat or cold), or in circumstances where other risks (air pollution, crime, etc.) make it desirable, it will be more comfortable and cheaper for occupants if they allow the building to be mechanically ventilated with heat recovery. Building controls will enable these processes to be automated if preferred and over-ridden as desired. This solution should be communicated to householders as an additional feature of high-performance and comfortable homes, and one that justifies the incremental cost. As noted elsewhere, this cost can be minimised if the requirement is codified and/or if conscious market transformation strategies are used to manage the paradigm shift in a socially optimal manner.

In summary, key requirements for a climate-adapted built environment in Australia include:

- Higher standards of thermal integrity for buildings – reflecting, to a greater degree than at present, a science- and evidence-based and forward-looking approach to standard setting;
- Ensuring that all buildings ratings and assessment tools accredited for use to demonstrate compliance with the energy performance requirements of the National Construction Code utilise climate files reflecting anticipated future climate conditions (updated as often as needed as new climate projections are made);
- Greater attention – including in the National Construction Code but also in planning schemes – to the adoption of solar passive design principles;
- A shift to mechanical ventilation with heat recovery for dwellings, and an associated education and awareness campaign for the full range of building industry professionals, education service providers and the general public;
- Greater attention to countering urban heat island effects in urban design – including via preserving natural breezeways, changing the albedo of surfaces, and incorporating appropriate amounts of green space and green cover into the urban form.

## Renewable and distributed energy

The advent of increasingly affordable solar energy at a distributed scale has already delivered enormous economic benefits to building owners and occupants, at the same time as reducing the environmental footprint of the built environment. The affordability and performance of this technology is expected to improve still further in future, while its utility will be extended by complementary developments in low cost distributed storage and smart energy management technologies. Note the trend over time for utility-scale photovoltaic (PV) costs in below.

PV technology is safe, noise-free, durable, has low visual impact and is emissions-free. Being embedded within the built environment, on the customers’ side of the meter, it provides a highly cost-effective way to discipline and provide competition for what have been excessive and poorly-justified increases in the cost of networked energy in Australia over the last decade. It also reduces peak network demands in summer, leading to spillover avoided costs for networks and reduced wholesale energy prices in most parts of Australia. This technology represents a significant opportunity to achieve dramatically higher energy and carbon performance in the built environment than was previously conceivable, at the same time as realising significant economic benefits for businesses and households.<sup>196</sup> Provided the initial cost of solar systems can be financed – and the scale of this challenge is diminishing all the time – they will materially reduce energy poverty and improve social well-being over the lives of these systems.<sup>197</sup>

Unfortunately, poorly-designed feed-in tariffs, and other subsidies offered in the past by governments, and increasingly ill-adapted National Energy Market constructs, have led to an over-reaction against solar, and by implication renewable, energy in Australia. This is clouding rational judgement by governments about the merits of solar energy in particular (the primary solution for distributed energy in the built environment). Consumers, on the other hand, appear to be suffering from no such difficulties, as PV sales continue to increase despite significant reductions in financial support from governments. The concerns of governments are also being fed by the network businesses and fossil fuel generators who are losing revenue as a result of competition from solar and renewable energy, consistent with our earlier observations (Chapter 2) about the political economy in Australia. In such circumstances, the public interest is likely

<sup>196</sup> We do not advocate a move away from solar passive and passivhaus ‘fabric first’ approaches to building design and construction; however, the greater risk at present would appear to be policies that either fail to recognise the benefits of solar energy, or seek to actively discourage its use, and in doing so, impose unnecessary costs on society.

<sup>197</sup> Energy poverty is financial hardship or stress caused by an inability to afford the quantities of energy needed to maintain a reasonable standard of living.



to take second-place to the private interests of powerful corporations – some of which have the additional leverage of being owned by state and territory governments, who benefit directly from the profits that these businesses make and who are therefore directly conflicted in their decision-making.

It should be uncontroversial that we should seek to ensure that necessary building energy performance standards are met at least cost. Indeed, this is consistent with the Government's and COAG's best practice regulation guides, as discussed in Chapter 3. PV systems can be considered either as an energy service within the built environment or, increasingly, as building fabric, as building-integrated PV systems become more prevalent, offering the additional value of reducing façade costs. If such approaches offer building solutions which are least-cost from a social perspective, it would be inefficient to require alternative and higher-cost solutions to instead be used. At present, PV is allowed for commercial buildings but not for residential buildings, except via Queensland' Code variation.

As noted above, there are sound reasons not to shift to the oft-parodied model of 'air conditioned tents with solar panels on the roof', even if this solution happened to offer a lower or equivalent cost to more conventional buildings systems. These reasons relate to risk and to human health and safety. The first solution relies on active technologies which can fail. In extreme conditions, the consequences of such failure could be fatal for building occupants. Passive solutions, founded on appropriate levels of insulation and the other solar passive principles noted above, are by contrast fail-safe and offer a greater assurance of health and safety outcomes. We therefore conclude that PV systems should not be used to trade-off adequate levels of passive thermal comfort in designs, even if it might appear cost-effective to do so.

At the same time, we should not ignore the reality that PV systems can achieve improved carbon and energy outcomes at lower cost than an increasing number of more conventional building solutions and technologies. Also, it must be recalled that the national requirement is that the built environment moves rapidly towards carbon neutrality. This can never be achieved through energy efficiency solutions alone: renewable energy is essential to achieving the necessary outcomes in our built environment. Therefore we conclude that onsite solar (or potentially other renewable) energy systems should be able – and actively encouraged – to be used to achieve above-minimum standards of energy/carbon performance; that is, standards that are higher than those required to manage immediate human health and safety objectives, as noted above, but which are necessary to ensure a safe climate for us all.

#### Energy cost considerations

The fundamentals of the long term energy market outlook in Australia are that the use of fossil fuels is expected to be an increasingly costly choice, as governments and markets increasingly select more responsible, climate-safe options over time, while renewable energy systems – which generally

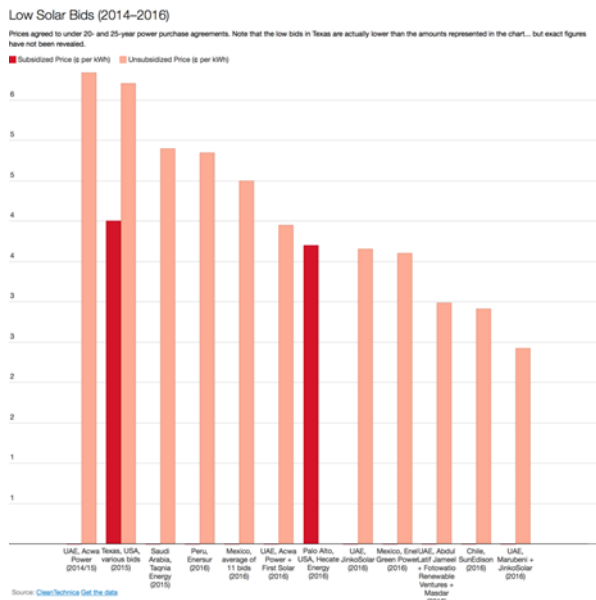
have no or very low running costs – are projected to continue to become cheaper, in addition to being climate-safe. These market fundamentals suggest that consumers will increasingly choose renewable energy, regardless of policy settings, simply to maximise their economic welfare. To assume or plan otherwise would be risky at best.

CSIRO projects that by 2030, wind and solar technologies will have similar levelised costs to gas and coal.<sup>198</sup> However, this appears to be a *highly* conservative assessment, as the best renewable energy projects today are already achieving levelised costs that are unable to be matched by any fossil fuel-based system. See

below, which indicates that the current world record price for utility-scale solar is 2.4 c/kWh (USD) (~AUD 3.2c/kWh). It may be noted that only two of the projects referenced in that figure are in OECD countries, and there are no subsidies present in this pricing. The Australian Government's *Australian Energy Technology Assessment* (AETA - not updated since 2013, despite being announced as an annual publication) indicated that gas combined cycle technology then had a levelised cost of 8.9 c/kWh, although gas prices in Australia have since risen strongly. Even at that 2013 levelised cost, combined cycle gas turbines would be some 280% more expensive than the lowest cost PV prices noted in . For reference, AETA notes the levelised cost of black coal integrated gasification combined cycle with carbon capture and storage as 24.7 c/kWh, some 270% higher than the then levelised cost of combined cycle gas, and 770% higher than the current lowest-cost PV. No CCS coal plants have been built in Australia to validate AETA's cost estimates.

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<sup>198</sup> <https://blog.csiro.au/wind-solar-coal-gas-to-reach-similar-costs-by-2030/>



**Figure 11: World Record Low Solar Costs**  
 Source: <http://cleantechies.com/2016/09/20/jinkosolar-marubeni-score-lowest-ever-solar-pv-at-us%2%A22-42kwh-in-abu-dhabi/>

Levelised costs of generation do not take into account network or other electricity system costs. There are the tentative beginnings of a debate in Australia about how the nature of electricity system investment will need to change, to facilitate a managed and secure transition to the low- or zero-carbon electricity generation system of the future. That system will in turn be a key enabler of a sustainable built environment in Australia, including to support future electric vehicles and transport systems in addition to all-electric and low/zero carbon households and businesses. The key beneficiary of such a system will be the electricity industry, but it and policy makers have considerable work to do to position the industry and governments as enablers of, rather than as impediments to, the required systemic change.

While a full treatment of this issue is beyond the scope of this study, it is nevertheless critical to the carbon and energy performance of the built environment, inter alia, that this transition occurs rapidly and smoothly. Two key enablers will be smart power and demand management technologies, on the one hand, and distributed (and also centralised) storage, on the other hand. Storage technologies will be embedded in transmission systems (hundreds or potentially thousands of MW scale, e.g., pumped storage); in distribution networks (MW scale battery storage); and in workplaces and households (kW scale battery storage and thermal storage); as well as in new generation forms that have integrated storage, such as solar thermal systems. Power management technologies are being, and will increasingly be in future, used to manage the constantly-shifting balance between local energy demand, PV output, storage capacity, and remote, grid-enabled supply. These smart technologies will interact in an information-rich environment, with enabling price signals and well-designed control and intervention strategies. If well-designed and managed, this

power system will be inherently more secure and resilient than the current one, in addition to largely or completely eliminating greenhouse gas emissions, thanks to widely distributed energy generation and storage and enhanced use of smart technologies.

As in the built environment more generally, the key impediments to the necessary changes are neither technological nor economic. They are policy designs based on outdated business models and market paradigms (such as one-way power flows, undemanding customers, and benevolent, publicly-owned utilities), which are exacerbated by a political economy which weights corporate interests more highly than the public interest. There is an extent to which some power consumers, both businesses and households, are willing to pay a premium for energy that is not supplied or controlled by utilities. This represents a major reversal of historical trends, in which utilities were widely viewed as acting for the public good and as drivers of household and wider economic well-being.

This phenomenon forms part of the wider cultural changes described in Chapter 2, which include diminishing trust in public institutions generally, and not limited to utilities. It would seem unwise for governments or utilities to overlook this factor when designing energy market policy frameworks for the future. The more coercive these frameworks, and the more they attempt to discourage efficient and least cost approaches, the higher will be the willingness of businesses and consumers to pay for disruptive strategies such as solar, storage and grid disconnection. It is already the case in Australia that businesses, and indeed whole cities, have been able to contract for renewable energy supply at a lower price than is generally available from the National Energy Market (NEM), and this while cancelling Large Generation Certificates to ensure additionality to the Australian Government's national Renewable Energy Target.<sup>199</sup> As the referenced article and the above data suggest, the transition to low-cost energy that is renewably generated will continue to be driven by market forces, and in part as a reaction to the higher cost NEM model, risking significant disruption of that model unless governments take swift action to align it with the new market realities.

From a buildings policy perspective, the prospect of cheaper and more sustainable electricity options does pose a conundrum – to what extent should we allow anticipated reductions in the greenhouse gas intensity of electricity supply to substitute for enhanced thermal and energy efficiency standards? One part of the answer has been given above – and that is that improved thermal integrity of Australia's building stock is required in any case for health, safety and energy poverty reasons. A second part of the answer is also suggested in the previous section on renewable energy, and that is that we should fully integrate building-based or distributed renewable energy into the National Construction Code.

<sup>199</sup> <http://reneweconomy.com.au/record-low-wind-energy-price-in-auction-but-solar-not-far-behind-12195/>

A third element – the extent to which offsite renewable energy can contribute to achieving specific carbon outcomes at a building or precinct level – is more challenging, because there is very high uncertainty at present about future energy policy settings, at the same time as there is ongoing technology disruption, with new record low prices being set by renewable energy projects almost weekly, and battery prices on a similar learning curve. As a result, it is impossible to predict what the future greenhouse gas intensity of electricity supply in Australia will be. There remains a significant risk of a reactionary response to this competitive pressure from renewable energy, which could risk an economically perverse increase in emissions and energy costs. However it is clear that, due to economies of scale, it will generally be cheaper for consumers to secure renewable energy through direct, power purchase agreements with large and remote generators than to generate on-site – although this market balance could be disturbed by changing market rules and constructs. The key question may be whether these agreements – which may be long-term, of up to 15 – 20 years (although the current trend is to shorter term ones) – can be treated as reliable, quasi-permanent features of building performance. Absent a legal framework that would guarantee this, to the satisfaction of building owners and users alike – which could readily be framed – there is likely to be significant uncertainty about this, potentially encouraging building-integrated solutions (although they involve a significant cost premium at present) or precinct-scale renewable energy generation system. At Barangaroo in Sydney, we see a mix of on- and off-site renewable energy, in addition to many energy and resource efficiency initiatives, being used to underpin that precinct's claim to be the first of its size in the world to be carbon positive.<sup>200</sup>

Overall, we conclude that the inherent logic of technological progress primarily, but possible future carbon policy secondarily, will continue to push consumers to choose renewable energy as a way of reducing both energy cost and emissions, and creating business value. This will increasingly offer the potential for lower cost and higher carbon performance solutions at the building scale over time. However, the national regulatory framework – in at least energy and buildings – is lagging sadly behind the pace of market change in Australia, and is now the major impediment to further progress.

#### Population, social change and planning considerations

Australia's population is growing, ageing and becoming increasingly urbanised. The Australian Bureau of Statistics projects that our population will reach between 37 and 48 million people by 2061. The median age of the Australian population is expected to increase from 37.3 years in 2012 to (up to) 44.5 years in 2061, while the share of people aged 85

years or older will increase from 2% in 2012 to 6% by 2061. The ABS noted that:<sup>201</sup>

*In 2011, over 85% of Australians lived in urban areas and nearly 70% lived in our capital cities, making Australia one of the world's most urbanised countries. In contrast, 100 years ago less than 40% of Australia's population lived in our capital cities.*

These trends – along with revealed social preferences – are already seeing a shift to higher density buildings and urban forms in Australia, including a significant shift to Class 2 or multi-unit dwellings – including aged care facilities. From the perspective of the carbon and energy performance of the built environment, this represents a potential but not guaranteed benefit. There is evidence that Class 2 buildings are more energy intensive than Class 1s on average.<sup>202</sup> Also, due to their higher density, and increasing height, the opportunity to generate energy with onsite solar is less when compared to a more extensive urban form built around Class 1 dwellings. Further, the risk of overshadowing of solar facades is greater in cities and as taller residential buildings become more prevalent. On the other hand, it is likely that the average dwelling size in Class 2 buildings is smaller than for Class 1s, although we are not aware of any national statistical source to verify this, and this might offset the higher energy intensity to an unknown degree. Second, it is very likely that the more significant impact of more compact urban forms will be reduced travel demand and related emissions, but again this should be verified in particular cases, and is likely to depend on journey to work lengths (and other trip lengths) and travel mode.

This may be affected by a further significant social trend towards home and local-hub based working patterns, and also online shopping, both of which offer the prospect of lower carbon emissions via avoided travel. It is important that local planning schemes and other laws support rather than frustrate this trend. Indeed, there is a rapidly increasing trend towards multi-purpose buildings that are designed to provide a high-quality, flexible and multi-functional built environment. The boundaries between the (often obscure) classes of buildings identified in the National Construction Code have long since blurred. It is increasingly common that the one building will house residential floors (where already there is a split in Code requirements between the dwelling units and the common areas, and where more commercial activity may be taking place in any case), floors used as hotels or serviced apartments, retail floors, a child care centre or preschool, and potentially others. Practically this creates challenges for building designers to understand which energy performance requirements apply in which areas of a single building. This does nothing to assist industry to comply with

<sup>200</sup> <http://www.barangaroo.com/discover-barangaroo/sustainability.aspx>

<sup>201</sup> Australian Bureau of Statistics, 3105.0.65.001 - Australian Historical Population Statistics, 2014.

<sup>202</sup> See, for example, pitt&sherry, *Pathway to 2020 for Increased Stringency in New Building Energy Efficiency Standards: Benefit Cost Analysis*, January 2012.

those requirements. An investigation of the extent to which Code energy performance requirements could be standardised regardless of building form could lead to a radical streamlining of the Code, at the same time as improved compliance.

What is clear is that the opportunity to leverage this social trend to achieve maximum carbon abatement has not yet been seized. Energy performance standards for Class 2 buildings have been shown to be less stringent than for Class 1s, with greater opportunity for cost-effective increases in energy performance standards than for Class 1 dwellings.<sup>203</sup> Yet at present, there is no proposal by governments in Australia to lift standards that were determined in 2009 even in 2019, a decade later. There is, however, background work being undertaken by governments to further investigate the case for doing so, both in the context of the NEPP and, separately, at state government level. Given the rapid rate of development of these buildings in our cities, we note that the cost of further delay in implementing cost effective standards will only lead to higher costs for householders over time, as well as additional national greenhouse gas abatement costs.

These examples provide further evidence that we have allowed building standards, and in some cases planning schemes and other laws, to lag behind important social and market trends – due in part, it would seem, to a reluctance to undertake routine maintenance on highly effective and cost-effective policies that are regulatory in nature. The opportunity costs associated with such policy failures have not been calculated. However, as noted in Section 5.1.1, ClimateWorks has calculated that a (further) five year delay in lifting energy performance standards in the National Construction Code alone would impose a direct cost of \$24 billion on the community, in the form of higher energy bills, while the 170 million tonnes of lost emissions reductions opportunities would impose at least another \$8.4 billion in costs on the economy.<sup>204</sup>

## An Optimal Policy Framework?

### Outcomes and Broad Character

It is important to be clear about the outcomes that any policy framework is intended to foster, and also the character of that framework – how it is intended to work – to ensure that both the outcomes and processes for achieving them are broadly agreed.

The outcomes we seek are a built environment that:

- Offers high standards of safety, security, comfort, amenity and public health – including the thermal integrity necessary to withstand the expected more severe future climate

- Achieves carbon neutrality for the entire building stock in a timeframe that enables Australia to meet its carbon budget over the period to 2050 – which may be as early as 2028<sup>205</sup>
- Achieves the lowest possible lifetime costs (capital + operating)
- Is diverse, flexible and responsive to a wide range of market signals.

The policy framework that delivers on these outcomes will:

- Have clear, agreed and long-term objectives, that are based on the best-available science and evidence
- Be fully consistent and integrated with related goals and frameworks, at least including energy markets, climate change, buildings and urban planning frameworks
- Deliver policy predictability through statutory processes that are predominantly rules-based and which limit the exercise of discretion
- Be applied consistently over time, with the minimum of necessary changes, in order to overcome the investment uncertainty
- Address both new and existing buildings
- Address occupants, owners and market intermediaries
- Be responsive to local climate conditions
- Include quality assurance to guarantee that intended outcomes are met and to enable redress where they are not
- Build the capacity of consumers, industry, researchers and policy makers to deliver the outcomes sought
- Use an optimal mix of policies and measures, at appropriate levels of government, to deliver the required outcomes at least cost, which will include outcome- or performance-based regulation where that is the most effective and least cost solution
- Encourage and take advantage of low- and zero-carbon innovation to achieve outcomes at least cost over time
- Enable market forces, including by creating markets in areas where they do not currently operate effectively
- Create an information-rich environment in which price and non-price information is used efficiently and effectively to inform market choices throughout supply chains
- Encourage and reward over-achievement in the short term
- Work to transform markets, overcome cost barriers and ensure that the necessary solutions are available to the market at affordable prices.

<sup>203</sup> Ibid.

<sup>204</sup> Assuming an average carbon abatement cost of \$20/t CO<sub>2</sub>-e.

<sup>205</sup> Climateworks/ASBEC, *Low Carbon High Performance Buildings*, May 2016.

### Context

The particular opportunity – and responsibility – of the national government is to offer leadership on issues of national and international significance, and this includes the carbon and energy performance of the nation and its built environment. The Australian Government is responsible for ensuring compliance with international treaties – such as the Paris Climate Agreement for example – that are ratified by the Australian Parliament. But even if no such treaties existed, the Australian Government by its position at the top of the governance hierarchy of the nation could not hope to escape accountability for national outcomes that are significant for all Australians, including the stability of climate systems. While, as noted in Chapter 4, competitive federalism can be a useful and at times necessary force, there is an extent to which strong national leadership reduces the need for less co-ordinated action at the sub-national level, while an absence of such national leadership will encourage the opposite. Thus, particularly for those who view competitive federalism as inefficient and potentially distorting of product markets, it is critical that the national government leads from the front.

### Elements

Bearing these points in mind – and noting that ‘national’ in this sense does not mean ‘Australian-government only’ but rather encompasses co-operative initiatives led or at least co-ordinated by the Australian Government – the key elements of a national carbon and energy policy framework for the built environment could be as follows:

19. National emissions targets – for the short, medium and longer terms – that are science-based and consistent with the Paris Climate Agreement; that is, reaching net zero emissions by around the middle of the Century and, importantly, keeping within Australia’s global carbon budget at all times before then.
20. A comprehensive, transparent and evidence-based strategy that details how the national emissions targets will be met in the short, medium and longer terms, including the key policies and measures that will be used in all sectors, including the built environment.
21. Effective carbon pricing. While, as noted in Chapter 3, carbon pricing may have limited direct impacts on efficiency choices in the buildings market, it will have very significant impacts on the optimal fuel mix and therefore carbon outcomes. If carbon is not priced, for example, building owners in higher carbon states and territories may be tempted to invest in gas as a way of achieving modest carbon savings relative to high-carbon electricity; however, doing so could lock in fossil fuel use for the life of the investment, and potentially lock out the renewable energy that is required to reach very low or zero emissions overall. Sending accurate market signals, via carbon pricing, will be important to achieve an optimal balance between renewable energy, gas options such as co- or tri-generation, and grid-based power.
22. Trajectories to net zero emissions for new and existing buildings over time that are consistent with meeting the above targets – noting that these will need to reference a trajectory for the reduction of greenhouse gas emissions in grid-based electricity supply and the measures that will give effect to that trajectory.
23. For all new buildings, energy performance standards that are reviewed and potentially updated every three years, using an agreed and statutory methodology and process, targeting the highest cost effective outcomes (a benefit cost ratio of 1) – such that stock turnover effects can do much of the work of transitioning the built environment to net zero by 2050. The National Construction Code would be given effect by national legislation – as per the Greenhouse and Energy Minimum Standards Act 2012206 – to limit poorly-justified state/territory variations (exclusions), while local applicability would be ensured, as now, by applying performance requirements by climate zone, and not by state/territory.
24. To ensure compliance, performance requirements would be set on an as-built basis and verified via post construction measurement. All buildings (including newly-constructed/refurbished ones) would be covered by mandatory disclosure requirements, to ensure that consumers and owners are well informed about actual, as distinct from modelled, energy performance. Other modernisation reforms would be implemented for the Code, including updating building types and reducing the number of separate performance requirements by building type to the greatest degree possible – a verified performance/outcomes based approach would enable simplification of the Code, while also making compliance much easier to demonstrate.
25. Also for new buildings, over-compliance with minimum performance requirements will be encouraged, including through the use of on-site or contracted off-site renewable energy (additional to nRET), a universal mandatory disclosure scheme, government procurement of above-minimum standard offices (and event venues, accommodation, etc.), and performance trajectories that enable and encourage developers to attain next/future Code performance levels – an approach as known as ‘stretch code’ or ‘beyond code’.
26. For the existing building stock, cost-effective opportunities to include ongoing performance requirements in the NCC should be implemented, such as mandatory audits and plant upgrades for commercial buildings at regular intervals (not exceeding 10 years).
27. Enhanced carbon performance for existing buildings would be encouraged primarily, at the national level, by

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<sup>206</sup> It is possible that this Act could be amended for the purpose.



mandatory disclosure, which should be continuous (annual) for non-residential buildings, while for residential buildings, a building passport would enable discovery of key documentation including energy assessments and compliance reports. For rental properties (which are effectively commercial buildings), minimum energy performance standards will be developed.

28. A national energy savings target and white certificates/retailer obligation scheme – to replace and expand upon existing state- and territory-based schemes. Best practice elements will include higher savings targets, consistent national application and rules, wide coverage of sectors – essentially expanded to cover at least the residential and small-to-medium sized commercial sectors, with primarily project-based and co-investment methodologies (no give-aways) that are only available where deeper cuts in energy use are achieved – such as significant retrofits that save at least 10% of a building’s, household’s or enterprise’s annual energy consumption, and equity considerations such as a primary focus on low-income households and social housing.
29. To enable higher energy performance standards to be achieved cost effectively, key building elements would be targeted with market transformation initiatives designed to increase the availability and reduce the cost of best practice technologies. These should at least include high-performance glazing, heat recovery ventilation systems,
30. At the same time, minimum energy performance standards (MEPS) and labelling would be expanded to cover all major building components. As with building performance standards, these MEPS and labelling provisions will be reviewed and potentially updated every three years using a rules-based statutory process and seeking a benefit cost ratio of 1. A high efficiency performance standard (HEPS) would be set for each product, providing a ready benchmark for above-code or stretch-code purposes.
31. The statutory process for Code and building product performance standard setting would anticipate expected reductions in compliance costs due to learning and technology development effects, and also take into account expected future climate conditions.
32. The Australian Government would review and implement all feasible opportunities to create an enabling environment for energy efficiency/carbon investment and information transparency. This could include tax incentives, such as accelerated depreciation, for very high efficiency (HEPS) components and retrofits. It could also extend to national enabling legislation to support environmental upgrade agreements being offered in all local government area.
33. To underpin these outcomes, the national government would create a dedicated, permanent and public interest buildings research institution charged with applying the agreed statutory process for standards updates, data gathering and publication, undertaking techno-economic

research to support market transformation policy development and to quantify and anticipate learning rates, and other functions as required. This institution should have as much independence from the government of the day as practically possible, including an independent board and levy-based or other hypothecated revenue sources. The culture of a ‘national project management approach’ to policy development and delivery would be instilled via this body and supportive governance arrangements.

34. The national government would also seek to achieve an integrated, coherent, strategically-aligned, complementary and co-ordinated set of policies and measures between jurisdictions, via enhanced officials and Ministerial-level arrangements. Since there are doubts about the timeliness and quality of past decisions by the COAG Energy Council, it is likely that significant changes in current administrative and decision-making arrangements will be needed if there is to be effective, rapid and co-ordinated action on buildings, energy and climate policies in the short term.
35. Noting the structural vertical fiscal imbalance between jurisdictions, this governance structure should also oversee national government funding of agreed building policies and measures at subnational level – state, territory and local.
36. The Australian Government would recognise the public good nature of data and therefore create as much data transparency as is possible regarding the nature of energy use and emissions and structural change in the built environment – to inform research and the energy services market – including by requiring disclosure of data held by its own agencies, but also energy businesses and market regulators, at the highest level of spatial and temporal disaggregation possible while protecting privacy and necessary confidentiality. This may require legislative amendment to make it clear that information may be collected, used and disclosed for public interest research purposes, as was recommended by the 2008 Australian Law Reform Commission review.<sup>207</sup>

State and Territory Level

#### Context

States and Territories have traditionally been sources of policy diversity, competitive pressure (for the Australia and other state/territory governments) and experimentation, to a far greater degree than would occur with a single governance and legislative framework. As noted with reference to the Inter-Governmental Agreement for the National Construction Code, as an example, Australian governments appear to prize uniformity of policy frameworks to a greater extent than they

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<sup>207</sup> Australian Law Reform Commission, *For Your Information: Australian privacy law and practice*, 2008, p. 124.

do other policy attributes, including diversity or excellence. Generally, this stance is justified with reference to limiting barriers to trade between states, or minimising costs for businesses that operate in multiple states, which are indeed worthy goals. However, if the outcome of this approach is that lowest common denominator standards are set, then these potential trade benefits need to be quantified and evaluated relative to the opportunity costs associated with sub-optimal regulatory settings. It is very likely that the value of these benefits would be dwarfed by the opportunity costs.<sup>208</sup>

In practice, considerable diversity of policies and measures exists around Australia despite exhortation to limit it. In any case, overlapping electoral cycles inevitably mean that diversity will continue to be a feature of the policy landscape for Australia's built environment. This can be a genuine strength, particularly if all jurisdictions follow best practices in monitoring, evaluating and publicly reporting on policy and program impacts – ideally using a consistent and comparable approach that would facilitate learning and sharing of best practices. In fact, there is no agreed or widely used policy/program reporting and evaluation framework in Australia, and developing such a framework should be a priority for national governance bodies.

There are sound economic reasons why an optimal mix of policies and regulations is likely to differ from state to state. These can include persistent differences in energy prices, and in some cases in factor prices, which may justify differing stringencies for measures (such as incentives under a national white certificates scheme). Second, the fuel mix, and particularly the greenhouse gas intensity of electricity consumption, varies very widely between states and territories. States and territories with low or zero emissions electricity supply may wish to focus additional effort on fuel switching from fossil fuels such as gas to electricity, while it is possible that high-carbon states and territories could still, for a time, reduce their overall emissions by switching to lower-carbon-intensity fossil fuels such as gas. Energy market fundamentals may discourage this, as noted above, while locking in additional fossil fuel use would appear an increasingly risky solution.

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<sup>208</sup> Wherever the expected social value associated with optimised and updated policy and regulatory frameworks exceeds the expected costs associated with that optimisation/updating process, then economic value is foregone by a failure to do so or by a delay in doing so. As noted earlier in this paper, the net social benefits associated with regulatory upgrades – in the NCC and MEPS/labelling at least – when they are calculated, are routinely counted in the hundreds or thousands of millions of dollars, while the cost of a full RIS process would be counted in tens or hundreds of thousands of dollars at the outside.

## Measures

Bearing the above in mind – and assuming key elements of the national level policy framework above were implemented – then key elements of the state and territory policy framework could include the elements listed below. We recall that states and territories would also continue to be involved with or lead elements of the national framework described above.

8. Setting above-minimum performance requirements, or including additional performance elements that jurisdictions believe are justified in their circumstances – which may include actions to compensate for any failure by the Australian Government to update national Code performance requirements or other key buildings policy settings, but also local considerations such as water availability/use efficiency. Below-minimum outcomes or trade-offs would not be permitted, as minimum energy performance requirements would already have been optimised as noted above.<sup>209</sup>
9. Ensuring effective planning of infrastructure, regions, cities, precincts, and individual buildings/developments, either directly or via enabling legislation for and collaboration with local government<sup>210</sup>, including to:
  - ensure appropriate master planning of new developments, including integrating locational and sustainable transport considerations in addition to those relating to buildings themselves, such as appropriate block/building orientation and solar passive performance
  - enable building-based or precinct-scale renewable energy supply
  - limit over-shading and preserve solar access for buildings
  - limit urban heat island effects via appropriate management of albedo, green cover/shading and heat rejection sources (e.g., ventilation, cooling towers, etc.)
  - optimise use of local resources (such as suitable rivers/water bodies as heat sinks)
  - fully integrate infrastructure investment decision making with local planning schemes and strategies, to ensure that the overall character of development encourages a low carbon footprint.
10. Designing and delivering incentive and market transformation programs tailored for the specific

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<sup>209</sup> Recalling that where unique provisions are able to be justified on the grounds of local climatic conditions, these provisions would be delivered in relevant climate-zones via a climate-adapted Code, with no variation being required.

<sup>210</sup> Noting that the relative roles of state/territory and local governments with respect to planning functions varies widely around Australia.

characteristics of the building market in each state/territory. While such programs could be at least partially funded by the Australian Government – reflecting vertical fiscal imbalance, but also to enable a degree of consistency – they should be designed and delivered locally to effectively target the different building techniques, industry contexts and capabilities (see below), climate zones and other factors that differ from state to state. These state-based initiatives should be co-ordinated with national ones to avoid duplication. This would mean only developing state-based initiatives where there is an expectation that important and cost-effective outcomes will not be achieved by national-level initiatives alone. This opportunity is closely linked to the next below, as targeted incentives and market transformation programs – along with awareness raising and training – may be necessary to respond adequately to particular local building industry practices – such as double-brick construction in WA, for example.

11. Promoting a culture of excellence in energy/carbon performance, including quality assurance for functions regulated/delivered by states such as licensing, registration and accreditation arrangements for building professionals; industry education and training; community information, awareness-raising and continuous professional development. This would focus on ensuring that intended regulatory outcomes are delivered effectively and efficiently; that, as a result, consumer welfare and environmental quality are protected; and that industry and the community are well-informed on issues relating to the energy and carbon performance of the built environment.
12. Modelling appropriate behaviours and stimulating demand for above-minimum performance outcomes through procurement policies, which could be co-ordinated with local governments, major corporates and other jurisdictions for maximum impact.
13. Within the context of a national white certificates scheme, developing specific methodologies that are relevant to the particular circumstances and needs of individual states and territories. These may include the local fuel mix, which may give rise to a need to apply specific fuel-switching measures, for example, or local construction practices/legacy building stock, which may require specific refurbishment/retrofit strategies.
14. Providing for transparency of key data, to enable effective policy development and analysis and to inform energy service providers. States hold much data that would help researchers and energy service providers to improve the quality of policy advice and analysis, and to better target abatement opportunities, by publishing as much of this data as is possible, e.g., through generic data websites, as some states and territories already do. Many data sets would hold significant value, including data on the specific nature and turnover of the building stock in each state (including area of new build, demolitions and major refurbishments annually), and

government energy/building use and fuel intensities, *inter alia*.

Local Level

### Context

As discussed in Section 5.3, local government is an increasingly important and dynamic driver of emissions abatement, including in the built environment, through the leadership many councils are offering in setting and taking action to achieve local carbon and renewable energy targets, both for their own operations and, in some cases, for their local government areas. Of course, such leadership is voluntary, and many councils remain disengaged. Many that are engaged have commenced by a process of consultation with their local community, to determine what the community perceives as priority issues.

A key attribute of many local governments in Australia is that they tend to be strongly networked with other Councils in their own states, through local government associations nationally, and through initiatives such as the Compact of Mayors, the C40, the Carbon Neutral Cities Alliance, Energy Cities and others internationally. This enables rapid transfer of ideas and learnings from policy or program experiments almost anywhere in the world. In our view, this open, networked culture is the key reason why we see greater policy experimentation and ambition at local government level in Australia than is the case at state/territory or national level.

Functionally, the roles and responsibilities of local government vary from state to state, depending upon the nature of their enabling legislation at state level. Therefore some opportunities noted below will be available to some but not all local governments. As noted above, a key opportunity for state governments is to ensure that their legislative frameworks for local government are indeed enabling, and indeed should require appropriate action to improve the carbon and energy performance of the built environment – to overcome the discretionary and therefore intermittent pattern we see in Australia today.

All councils have a key role in regulating the development process at local levels. This creates the opportunity to influence carbon outcomes in a positive manner, but also to do the opposite, depending upon the nature of local planning schemes and requirements. Property interests, land speculation and, in many cases, pressure from other levels of government, can all work against the development of spatially-efficient and appropriately planned built environments. To counter such pressure, it is critical that local governments develop strategic planning frameworks that comprehend the consequences of key choices for carbon intensity. Fringe housing development, new commercial precincts remote from existing centres, and local infrastructure investment choices can all lead to increases in carbon emissions which, over time, could be extremely large. Yet it is not clear that local government decision making

processes require these long term emissions consequences to be understood and taken into account in the decision-making process.

While a detailed study of best international planning practices is not within the scope of this project, excellent practices are seen in many European cities and in some North American cities such as Baltimore, Seattle and Vancouver. A common feature is master planning – essentially defining in advance the key characteristics and outcomes sought for a green- or brown-fields development, and then actively advocating, tendering or contracting for their supply, rather than allowing a developer-led process where the local government and community is placed into a potentially negative role of refusing or attempting to modify inappropriate developments. Instead, a community-led process determines what *is* desired, and then works with the development industry and community to ensure it is delivered. Master planning can extend to setting above-minimum energy performance requirements, encouraging resource efficiency through local energy generation and storage, grey and black water treatment, water sensitive urban design, ensuring appropriate lot orientation, maximising solar access for every site, ensuring that the development is appropriately sited and connected to the wider city or region via sustainable transport modes, and many other aspects that will create social as well as private value for decades to come. Increasingly, councils should be responsive to the growing demand for integrated living/working precincts which, amongst other characteristics, can radically reduce travel demand and related emissions.

As discussed in Section 7.2.4 above, increasingly local governments must be aware of and responsive to the changing needs and aspirations of the community, and supportive of the community's growing desire to live in high quality and sustainable environments, with many eschewing the traditional single dwelling, suburban style of development. While some may choose this option, Councils should be encouraging and enabling more creative and lower carbon choices as well. This will require research to understand the quality attributes that people seek in urban living – creating attractive streetscapes and neighbourhoods, integrating transport and social/retail services, providing sufficient greenspace and avoiding 'concrete jungles', encouraging architectural quality and complementarity, ensuring privacy and noise protection, encouraging renewable energy generation integrated into the built environment, providing adequate street lighting, *inter alia*.

#### Elements

Noting the above, the key elements of an optimal suite of policies and regulations for the built environment at local government level would include:

4. Leadership at local level on carbon abatement action, through setting targets and creating detailed strategies to achieve those targets; engaging with stakeholders and the community; and creating a supportive environment

for low-carbon innovation at the local level. Particularly while national and some states policy signals on carbon remain conflicted or unclear, there is a key role for local government to 'look through' the noise and focus on simply taking effective action, to continue to share the results widely with other councils, and to continue to take inspiration from best practices at local level from around the world.

5. Setting above-minimum standards for energy/carbon performance at the local level, and encouraging excellence in carbon performance – e.g., zero carbon precincts as well as buildings.
6. Community education and engagement. Councils are uniquely situated to influence local community attitudes and behaviours over time through strategies such as consistent messaging, information provision, structuring local fees and charges to consistently incentivise sustainable choices, and taking high-profile action to counter inappropriate development – hence reinforcing with the wider community the commitment to sustainable development choices.
7. Responsible and enabling planning environments, including strategic planning at the LGA level and master planning of precincts that encourage low- and zero-carbon built environments, including minimising urban sprawl and car dependence, maximising synergies between transport infrastructure and urban development, embedding passive solar design into all new and re-developments, preserving solar access<sup>211</sup> and minimising barriers to low-impact forms of renewable energy (such as PV) in the urban environment, countering urban heat island effects and offer multiple benefits through urban trees and greenery, encouraging active and public transport options (for example by providing bike and scooter lanes, bus lanes, shaded footpaths, etc.), providing electric vehicle infrastructure, and encouraging industrial ecology and efficient use of local resources and many others.
8. Modelling appropriate behaviours and stimulating demand for above-minimum performance outcomes through procurement policies, which could be co-ordinated with neighbouring and regional councils, state governments and local businesses for maximum impact.
9. Providing for the maximum transparency in data access while preserving necessary privacy and confidentiality – for public interest research and energy service provision.

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<sup>211</sup> With renewable energy being increasingly critical to affordable energy service provision, there is a risk that owners and tenants of buildings with poor solar access will face increasing hardship and energy poverty risks. At a minimum, councils should ensure that all new developments have good solar access themselves and do not impact negatively on the solar access of others.



## Pathways for Change

Articulating a potentially ideal policy and regulatory framework for the built environment may help to stimulate debate about aspects of Australia's current frameworks and the extent to which there is a need and opportunities for reform. But identifying needs and opportunities is no guarantee of reform. In Chapter 2 we described some reasons for this:

- deep-seated cognitive biases that make it difficult for us to contemplate, let alone plan rationally to avoid or limit, events that might be catastrophic and irreversible, and for which we are collectively responsible, and which therefore generate feelings such as terror and guilt, which in turn invite coping strategies such as denial
- political economy, which is strong in Australia due to the size and influence of the fossil fuel based industries
- cultural or ideological attachments to free markets and minimising regulation.

To this list, we could add the progressive break-down in public trust in public and national institutions, including government – a phenomenon not at all limited to Australia but, as documented by Tony Judt, widespread in at least the Western world since the 1980s. In Australia this phenomenon has arguably created declining expectations about what governments, regardless of which party they are led by, can and should achieve. The opening paragraph of Judt's final work, *Ill Fares the Land*, is worth repeating here:

*Something is profoundly wrong with the way we live today. For thirty years we have made a virtue out of the pursuit of material self-interest; indeed, this very pursuit now constitutes whatever remains of our sense of collective purpose. We know what things cost but have no idea what they are worth. We no longer ask of a judicial ruling or of a legislative act: is it good? Is it fair? Is it just? Is it right? Will it help to bring about a better society or a better world? Those used to be the political questions, even if they invited no easy answers. We must learn once again to pose them.*

In Australia, and a quarter of a Century after our first *National Greenhouse Response Strategy* was released in 1992, we are still seeking bases and rationales upon which to build an effective national climate policy. This more than anything else speaks eloquently of the power of the factors noted above to frustrate rational policy debate, development and implementation.

We have also to acknowledge that the particular history of policy endeavour in this field – both successes and failures – has created a path dependence which now shapes the responses of parties to the available options.

- Carbon pricing – globally acknowledged as the most important and effective economy-wide and market-based abatement solution – has been sidelined for at least the time being.

- Insulation – one of the most cost-effective solutions for reducing emissions, increasing comfort and reducing exposure to heatwave risks – is currently weakly supported, following the government failure of the Home Insulation Program.
- Rooftop solar is weakly supported by governments – at the same time as it is lauded by consumers – because of a legacy of poorly designed feed-in tariff schemes and the failure of those scheme's managers to monitor and respond quickly to changing product and energy prices.
- Renewable energy more generally is criticised, it seems, for its very success in reducing emissions and costs – that is, for achieving the goals that were set for it in the then Mandatory Renewable Energy Target (MRET) developed by the Howard Government in the late 1990s – and for the failure of policy designers to anticipate the need for change in NEM rules to facilitate the necessary transition to a high renewable energy share, even though that was the intent of government policy.
- Successful and well-supported abatement programs have been stopped – again, by governments of all colours – including the Greenhouse Challenge Program, the Energy Efficiency Opportunities program, the Energy Efficiency Best Practices Program, the Community Energy Efficiency Program and many more, including in those states that responded to the introduction of carbon pricing and federal program by cutting their own. Remarkably, these program closures were encouraged by officials seemingly more interested in the idea of (non) complementarity than with evidence-based policy.

By the middle of this decade, progress with regulatory development in this field had largely ceased, despite a clear, documented and unrivalled track record of success. While the machinery of standards review has recently restarted, for example under the National Energy Productivity Plan, no policy announcements or commitments have been made that indicate a desire or intent to implement policy or regulatory reforms. In the meantime, community, media and business attitudes towards action on climate change have, at least for some, been shaped by the confusing and inconsistent signals emanating from governments over time. Uncertainty for investment in carbon-emitting or -abating activities is very high, impacting not only on outcomes in the National Energy Market, but also in energy efficiency and renewable energy investment – although the latter has had a temporary reprieve following the negotiation (down) of 2020 targets under nRET. Finally, without clarity of policy intent, risks of reactionary policy changes are high.

Judt tells us that the writing of *Ill Fares the Land* was prompted by the simple question, from one of his undergraduate students, 'How did it get this bad?'

We have noted in this study that there are some examples of excellence, and even global best practices, in the policy and



regulatory environment for carbon outcomes in Australia's built environment. But they are few in number. And as we ponder the reasons for this, and optimal solutions, emissions in Australia and around the world continue to rise on a daily basis. While unreasoned haste in reframing national policy settings is not called for, a strong sense of common purpose and urgency is.

With such a legacy to overcome, how do we restart the process of rational policy debate and development?

The research community has a critical role and opportunity to provide the answers: we must champion the role of science, in determining level of policy aspiration, and evidence and objective analysis, in shaping optimal policy and regulatory settings.

Practically we could hope for a three-step approach to move forward:

1. In the short term, identifying and implementing reforms and enhancements to all existing (at least

national) measures, with the aim of maximising their cost-effective impact – this would extend to setting minimum outcome expectations for all initiatives in the National Energy Productivity Plan and addressing complementary initiatives in the National Energy Market. This would amount to the Australian Government getting its own house in order.

2. A medium term process of engagement with states and territories, local government and the wider community (not only industry) to propose reshaping the overall policy framework nationally to reflect the best elements of Australian as well as international best practice.
3. Designing and implementing the longer term processes of market transformation that will enable a rapid transition to the low- and zero-carbon built environment of the future, while maximising economic and social benefits.

## Appendix A: International Policy Case Studies

This Appendix includes the following case studies (although grouped by geographic region):

Case Study	Policy/Program Type (Name)
Brussels	Building code / capacity building / PassivHaus ( <i>BatEx</i> )
Massachusetts	Stretch code ( <i>Stretch Energy Code</i> )
Netherlands	Net zero retrofitting / financing ( <i>Energiesprong</i> )
New York City	Mandatory auditing and upgrades ( <i>Greener Greater Buildings Plan, Retrofit Accelerator</i> )
EU Directives	Directives ( <i>Energy Performance of Buildings Directive</i> )
US Building Codes	Building codes
Singapore	Mandatory HVAC auditing / benchmarking ( <i>2<sup>nd</sup> Green Building Master Plan</i> )
Tokyo	Urban cap-and-trade ( <i>Tokyo Cap-and-Trade Program</i> )
US	Code Compliance
US	High performance labelling ( <i>Energy Star</i> )
China	Minimum energy performance ( <i>Hundred Energy Efficiency Standards</i> )
EU	Cost-optimisation
Denmark	Building code
Germany	Financing ( <i>KfW CO<sub>2</sub>-Rehabilitation Program</i> )
Hong Kong	Mandatory disclosure / auditing ( <i>Buildings Energy Efficiency Ordinance</i> )
Vancouver	Building code / financing / capacity building ( <i>City of Vancouver Zero Emissions Building Plan</i> )
California	Mandatory disclosure / data collection ( <i>Comprehensive Energy Efficiency Program for Existing Buildings</i> )
Denmark	Mandatory disclosure ( <i>Energimærkning</i> )
US EPA	Volume purchase ( <i>High Insulating Windows Volume Purchase Program</i> )
France	Minimum requirements for upgrades
China	Mandatory disclosure
NZ	Governance - dedicated EE body
US and/or NZ	Weatherisation
India	Government procurement
PassivHaus	PassivHaus

## Europe

<b>Policy name:</b> EU governance	<b>Country/State/LGA:</b> European Union
<b>Policy type:*</b> • All	<b>Policy sub-type:*</b> • All
<b>Scope:</b> • All	<b>Key points:</b> • Governance • Interaction between policies

### Description:

- The EU has set a target of 20% energy savings by 2020 (compared to projected energy use in 2020) and 27% or greater by 2030. To meet these targets the EU has issued two Directives in relation to building energy performance: the Energy Performance of Buildings Directive 2010; and the Energy Efficiency Directive 2012.
- The Directives are laws, which individual countries are required to transpose into national law.
- Under the Energy Performance of Buildings Directive 2010:
  - energy performance certificates are required for the sale or rental of all buildings (mandatory disclosure)
  - countries must establish HVAC inspection programs or put in place equivalent measures
  - all new buildings must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018)
  - countries must set minimum energy performance requirements for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.)
  - countries have to draw up lists of national financial measures to improve the energy efficiency of existing buildings
- Under the Energy Efficiency Directive 2012:
  - countries make energy efficient renovations to at least 3% of buildings owned and occupied by government
  - governments should only purchase buildings which are highly energy efficient
  - countries must draw up long term national building renovation strategies
- Under these Directives, countries are required to draw up National Energy Efficiency Action Plans every 3 years.
- The European Commission provides support programs:
  - Concerted Action EPBD – a forum to promote dialogue and the exchange of best practices between countries
  - BUILD UP Skills – provides training to increase the number of qualified workers able to undertake energy efficient building renovations and build nearly zero energy buildings
  - BUILD UP Portal – provides a forum in which experts share information on best practice
- The EU has set up financing schemes:
  - EU Horizon 2020 – supports research, demonstration and market up-take of energy efficient technologies
  - Project development assistance facilities to support the development and launch stages of ambitious and replicable energy efficient projects.
  - [European Energy Efficiency Fund \(EEE F\)](#) – €265 million fund, provides debt and equity instruments to local, regional and national public authorities
  - [Private Financing for Energy Efficiency instrument \(PF4EE\)](#) – financial instrument which co-funds energy efficiency programmes in EU countries

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- [European Structural & Investment Funds \(ESIF\)](#) – more than €27 billion to support the shift towards a low-carbon economy
  - Energy Efficiency Financial Institutions Group (EEFIG) – set up with UNEP Finance Initiative to engage with financial institutions to address challenges in accessing long-term financing for energy efficiency
  - [Investor Confidence Project - Europe](#) – aims to develop a set of best practice standards for renovating buildings so as to reduce transaction costs and make risk manageable for investors
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References:

- <https://ec.europa.eu/energy/>
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<b>Policy name:</b> Cost-optimisation	<b>Country/State/LGA:</b> EU
<b>Policy type:*</b> Market regulation	<b>Policy sub-type:*</b> Information disclosure
<b>Scope:</b> All buildings	<b>Key points:</b> Calculation of cost-optimisation as trigger for setting minimum standards

Description:

- EU sets minimum requirements for setting of minimum standards in terms of cost optimisation.
- Article 4(1) requires Member States to take the necessary measures to ensure that minimum energy performance requirements for buildings are set with a view to achieving cost-optimal levels.
- The Regulation states: "National minimum energy performance requirements should not be more than 15% lower than the outcome of the cost-optimal results of the calculation taken as the national benchmark."
- This provides an additional point of leverage. Not only are countries required to do these calculations (allowing visibility of options), but also required to update standards accordingly.
- The EU has a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements – 'rules for assessing cost optimisation'. The assessment by member states follows a framework laid out in the CDR 244/2012.
- The framework does not take into account several variables, such as the increase in building value of better performing buildings and further co-benefits (e.g. reduced import dependency, job creation, noise reduction, indoor air quality, etc.). However, member states can set their minimum requirements above the cost-optimal levels in order to take these additional benefits into account as they see fit. The Netherlands is an example of a country that has introduced a more refined methodology for evaluating the cost-optimality of code revisions.
- Countries are required to update calculations every 5 years, and cost optimal performance levels monitored and adjusted to target: the introduction of nearly zero energy buildings in new buildings as from 2021 (public buildings from 2019); the introduction of buildings refurbished into nearly zero energy buildings (part of national plans on nearly zero energy buildings), and; environmental targets for the sector as a whole (e.g. 2050 targets).

In the Australian context:

- There is no such requirement in Australia. While federally some of these calculations are done on an as needs basis with the production of a RIS. How does the 15% compare to RIS results and resulting updates to code in Australia?
- How does the methodological framework laid out in the CDR 244/2012 compare with current practice in Australia?

Market barriers/failures addressed?

- Information asymmetry

In what way(s) does this represent best practice?

- Calculation of cost-optimisation as trigger for setting minimum standards for buildings and building components

References:

- Levine et al (2012), *Building Energy Efficiency Best Practice Policies and Policy Packages*, Ernest Orlando Lawrence Berkeley National Laboratory. <https://china.lbl.gov/sites/all/files/gbpn-finaloct-2012.pdf>
- [http://www.nyc.gov/html/gbee/downloads/pdf/appendix\\_a.pdf](http://www.nyc.gov/html/gbee/downloads/pdf/appendix_a.pdf)
- [https://ec.europa.eu/energy/sites/ener/files/documents/Assessment%20of%20cost%20optimal%20calculations%20in%20the%20context%20of%20the%20EPBD\\_Final.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/Assessment%20of%20cost%20optimal%20calculations%20in%20the%20context%20of%20the%20EPBD_Final.pdf)
- GBPN (2014), *Designing and Implementing Best Practice Building Codes: Insights from Policy Makers*.



<b>Policy name:</b> <ul style="list-style-type: none"> <li>BatEx</li> <li>Building code / Passiv Haus</li> </ul>	<b>Country/State/LGA:</b> <ul style="list-style-type: none"> <li>Belgium/City of Brussels</li> </ul>
<b>Policy type:*</b> <ul style="list-style-type: none"> <li>Financial incentive</li> <li>Regulation</li> </ul>	<b>Policy sub-type:*</b> <ul style="list-style-type: none"> <li>Positive financial incentive</li> <li>Performance and prescriptive</li> </ul>
<b>Scope:</b> <ul style="list-style-type: none"> <li>New and heavily renovated residential and commercial</li> </ul>	<b>Key points:</b> <ul style="list-style-type: none"> <li>Passiv Haus</li> <li>Building code stringency</li> </ul>

**Description:**

- Following the European Directive that all new buildings be nearly zero energy by 2020, Brussels introduced a number of initiatives to first stimulate the market and then move to codify a low-energy standard for all new and heavily renovated buildings.
- Introduced the grant program BatEx in 2007, with the goal of stimulating the market and demand for sustainable buildings, demonstrating technical and financial feasibility, and recognising excellence in environmental performance. Projects had to meet criteria: strive towards defined passive standards; prioritise environmentally friendly construction; demonstrate good architectural quality; and be replicable in technical and financial terms. Applied to new builds or renovations of all building types of any size. \$36 million UDS was granted to 243 projects over 7 years.
- Moved to codify a low-energy standard based on Passiv Haus in 2009. PEB 'Passive 2015' for all new and heavily renovated buildings and deals with: net heating and cooling requirements; primary energy consumption; ventilation; and airtightness.
- Required all new public buildings to be built to the standard from 2010.
- Mandated that from 2015, all new and heavily renovated buildings to meet the standard.

**Market barriers/failures addressed?**

- Financial, information, market.

**In what way(s) does this represent best practice?**

- While other jurisdictions provide incentives for building to Passive House standards, Brussels is currently the only jurisdiction to mandate for all building types.
- Is an example of market transformation. Working to actively stimulate the market for low-energy buildings prior to codifying.

**References:**

- Yancey et al, 2016, *Jump-starting Passive House in New York City and Beyond*, ACEEE Summer Study on Energy Efficiency in Buildings 2016
- Pitt&Sherry, 2016, *Accelerating Net-Zero High-Rise Residential Buildings in Australia*

Policy name: Energiesprong (Energy Leap)	Country/State/LGA: Netherlands
Policy type:*	<b>Policy sub-type:*</b>
<ul style="list-style-type: none"> <li>Voluntary action</li> </ul>	<ul style="list-style-type: none"> <li>Hybrid, voluntary retrofit standard, linked with financial model</li> </ul>
Scope:	<b>Key points:</b>
<ul style="list-style-type: none"> <li>Existing residential</li> </ul>	<ul style="list-style-type: none"> <li>Net zero retrofitting</li> <li>Finance mechanism</li> </ul>

Description:

- Net zero energy retrofit/refurbishment program, delivered with high value construction and investment model.
- Standard retrofit package takes less than 2 weeks and residents can continue to occupy the residence while being undertaken. Works include: solar PV cassette roof; new insulative envelope; heat pump heating/cooling; removal of gas to the property; new low maintenance 'glass' kitchen and bathroom; high efficiency appliances.
- Have developed prototypes and aim to stimulate market to bring down costs. Have completed more than 100 homes and associated costs have reduced, and are expecting a large step change in costs by 10,000 homes.
- The Government financed the first 4 years of the market development team to drive what is now an industry lead program. Social housing organisations have been targeted as the initial market, with the sector committing to deliver 111,000 homes.
- Finance model: housing association (HA) funds capital works, resident pays a set rate per month (set at less than previous electricity bill), HA pays a monthly fee to contractor to maintain improvements, contractor guarantees energy performance over 30 years.

Market barriers/failures addressed?

- Financial
- Information asymmetry

Evidence of effectiveness/cost effectiveness?

- Have completed more than 100 homes and associated costs have reduced (expecting a large step change in costs by 10,000 homes).
- Has had significant interest internationally. Market development teams have been established in France and the UK, with prototypes expected to be completed early 2017. Early market development also taking place in Germany, Italy and New York.

Apparent theory of action?

- Market transformation

In what way(s) does this represent best practice?

- Market transformation
- Financing mechanism
- Best practice retrofitting

References:

- [www.housingeurope.eu](http://www.housingeurope.eu)
- [www.energiesprong.eu](http://www.energiesprong.eu)
- Pitt&Sherry, 2016, *Accelerating Net-Zero High-Rise Residential Buildings in Australia*

Policy name: Energy Renovation Plan for Housing	Country/State/LGA: France
Policy type: ✳ Mixture of financial incentives and voluntary action/behaviour change programs	<b>Policy sub-type: ✳</b> Positive financial incentives and engagement, information, tools and assistance, training, capacity building
Scope: Existing residential buildings	<b>Key points:</b> Multi-faceted residential retrofit program.

Description:

- Prior to the Paris agreement, France had already set ambitious long-term goals to cut greenhouse gas emissions by 75% by 2050 compared with 1990 levels. With a target of 38% energy reduction in the building sector by 2020 also set. To meet this target there was also a goal of deep renovation of 500,000 dwellings annually.
- The Energy Renovation Plan for Housing was released in 2013, with the dual aim to reduce energy consumption and tackle fuel poverty in the residential sector, through the following:
  - Support for households to engage in decision-making processes regarding renovation
    - One-stop-shop information service, widely advertised nationally and delivered through 450 Renovation Service Points.
  - Improve financial arrangements by providing assistance adapted to each individual household's situation, with the aim of having packages suitable for all households nationally, and a focus on social housing (with aim to renovate 120,000 houses by 2017).
    - Including establishing a guarantee fund, providing zero-interest eco-loans, tax credits, third-party funding.
  - Support development of the renovation market and sector to improve quality and bring down costs associated with renovation work
    - Including mass training of for companies and building trades, introduction of quality label to allow certification of expertise, and development of the supply chain (including support for research regarding mass renovation of housing stock).
- Evaluation of the program's costs effectiveness (using the EU's cost-optimality methodology), found that when evaluated over a 30 year period, deep renovation was least costly. The evaluation recognised the following benefits of building renovation:
  - Job creation – estimated 75,000 jobs will be created by the renovation plan
  - Reduction in energy consumption and its contribution to energy security and goal of energy independence
  - Increased property values
  - Increased comfort and associated health and wellbeing benefits (including reduction in health problems and fuel poverty, estimated to affect 3.4 million homes)
  - Increased purchasing power and benefit to economy (due to reduced energy bills)
  - Environmental benefits

Market barriers/failures addressed?

- Information asymmetry
- Financial barriers

References:

- BPIE (2014), *Renovation Strategies of Selected EU Countries: A Status Report on Compliance with Article 4 of the Energy Efficiency Directive*.

Policy name: Building code	Country/State/LGA: Denmark
Policy type:*	<b>Policy sub-type:*</b>
Market regulation	Hybrid
Scope: Residential and commercial buildings	<b>Key points:</b> Prospective increases to building codes

Description:

- Denmark has a long history of clearly defining future code targets. Danish government have agreed to progressive building code improvements since introduction in 1992, with targets of zero energy by 2020 agreed to.
- The code includes minimum requirements and low energy classes that will become code in specified future years. If a building is able to meet future versions of the code, then they can be certified to future code, futureproofing an investment and incentivising going beyond minimum code.
- Passivhaus equivalent was introduced in 2010, and clear paths towards zero energy by 2020 set.
- Long-term targets allow time for the market to prepare for changes, and incentivises building above code.
- This is coupled with a long history of mandatory disclosure requirements. Denmark was the leading EU country in this regard, introducing requirements prior to the EU Environmental Performance of Buildings Directive (see case study below).

References

- Levine et al (2012), *Building Energy Efficiency Best Practice Policies and Policy Packages*, Ernest Orlando Lawrence Berkeley National Laboratory. <https://china.lbl.gov/sites/all/files/gbpn-finaloct-2012.pdf>
- GBPN (2014), *Designing and Implementing Best Practice Building Codes: Insights from Policy Makers*.
- International Energy Agency (2007), *Energy Efficiency in North American Existing Building Stock*.

Policy name: Energimærkning	Country/State/LGA: Denmark
Policy type: Market regulation	<b>Policy sub-type:</b> Information disclosure
Scope: Residential and commercial buildings	

Description:

- Denmark was the forerunner in mandatory disclosure, having launched its mandatory energy rating systems for commercial and residential buildings in 1992/1993.
- When the EPBC directed the development and implementation of labelling programs by each of the member states, Denmark was the only country able to implement legislation before January 2006.
- Energimærkning uses the one asset methodology to rate new and existing residential and commercial buildings.
- The rating is calculated using assumptions of performance based on inherent features of a building, independent of the occupant's energy usage and patterns. The elements considered are building envelope, HVAC, hot water, as well as lighting for non-residential buildings.
- This values the efficiency of structures themselves, making for better comparison in a market where building energy performance ratings have a history.
- A final intensity score is estimated, but may differ from actual performance depending on occupant usage. For this reason, Denmark does not display an intensity figure on the label, instead allocating only a broader rating category (from A to G). And while the rating does not take metered energy consumption into account, the program also requires the disclosure of metered heat consumption for residential buildings and metered heat and energy consumption for commercial buildings.
- Includes requirement for onsite audit by accredited energy consultant and inclusion of detailed description of possible improvement measures with calculated energy savings potential of all measures individually.
- Only organisations with ISO 9001 third party certification can be accredited to undertake ratings and compliance checks.
- Have developed accompanying support tools for industry, such as the consultants handbook which provides: foundation for quality assessment; guide for assessment of building etc.; guide for calculation; guide for advises on savings; guide for filling in energy certificates; guide for reporting / procedures etc.
- Denmark has integrated its code requirements with disclosure, such that a rating is required to get planning approval (i.e. the energy certificate is required as evidence of minimum performance for building permission to be granted). The code requires new buildings be class B, and further separates the A ratings into A1 and A2, so as to allow a building to be rated to future higher minimum requirements under the code.

Market barriers/failures addressed?

- Information asymmetry

Evidence of effectiveness/cost effectiveness?

- An empirical analysis undertaken on the program in 2010 suggested that a green rating (i.e. A to C in an A to G scale) is associated with a 3.7% higher sale price.

In what way(s) does this represent best practice?

- Support tools for industry such as consultant's handbook are considered best practice
- Integration of rating scheme and building code, including setting future minimum code revisions and aligning with rating categories.
- Requirement for onsite energy audit by an accredited organisation and inclusion of detailed costed recommendations for measures to improve building performance. For new buildings and significant upgrades under the code, this may trigger requirements to undertake cost effective upgrades beyond the original design (see case study on Danish building code).

References:

- <http://www.buildingrating.org/document/comparing-building-energy-performance-measurement>



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- [http://www.bbsr.bund.de/BBSR/EN/Publications/BMVBS/Online/2010/DL\\_ON032010.pdf;jsessionid=2DBE4089D4E9699473104A4C400707E3.live11291?\\_blob=publicationFile&v=2](http://www.bbsr.bund.de/BBSR/EN/Publications/BMVBS/Online/2010/DL_ON032010.pdf;jsessionid=2DBE4089D4E9699473104A4C400707E3.live11291?_blob=publicationFile&v=2)
  - Brounen, Dirk and Nils Kok, "On the Economics of Energy Labels in the Housing Market," *Journal of Environmental Economics and Management* 62(2), September 2011, pp. 166-179.
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Policy name: KfW CO2-Rehabilitation Program	Country/State/LGA: Germany
Policy type: Financial incentives	<b>Policy sub-type:</b> Positive
Scope: Existing residential and commercial buildings	

Description:

- Germany has set long term targets for the building sector:
  - By 2020 achieve a 20% reduction in heat demand.
  - By 2050 achieve 80% reduction in PED in buildings, existing buildings to be ‘almost climate neutral’.
- The CO2-Rehabilitation Program is run through the KfW (a government-owned development bank), with the aim of reducing energy consumption in existing building stock, contributing significantly to the federal building targets. Is a package of complementary measures including targets, policies, finance and promotional programs.
- Offers different funding streams through the one program, such as government-backed loan financing, grants, and tax rebates through retail banks.
- Provides tiered incentives, where the higher the resulting efficiency the more generous the associated loan and/or grant. Loan interest rates range from 1%-3%, while grants of up to €15,000 are available.
- Uses a building rating scheme to assign level of incentive. KfW Efficiency House 100 is a renovation that meets the performance of an equivalent new building, while the best performance standard KfW Efficiency House 55, uses 55% of the energy of an equivalent new build. The level of incentive changes with building performance, for example a KfW efficient building 115 receives a 2.5% credit and subsidy, while a KfW efficient building 55 receives a much higher subsidy of 12.5%.

Market barriers/failures addressed?

- Financial

Evidence of effectiveness/cost effectiveness?

- The German government takes a holistic perspective to cost effectiveness of the program, looking at additional tax income resulting from the improvements, as well as reduced social costs, and employment that the industry generates. It is estimated that the program has generated an additional budget revenue (including taxes, social security contributions, and reducing costs of unemployment) of 4-5 euros for every 1 euro of public expenditure.
- Between 2006 and 2014, KfW has funded renovation or construction work of 3.5 million homes, with a total investment of 159 bn euros. Approximately 33% of all refurbished buildings are co-financed by the CO2-Rehabilitation Program. For every 1 euro spent, the program has leveraged 12 euros of private investment.
- Results have shown a GHG savings of 7.1 million tonnes a year, and 300,000 jobs per year in the small to medium sized construction market.

In what way(s) does this represent best practice?

- Successful financing mechanism driving the upgrade of existing building stock.
- Best practice regarding evaluation of cost effectiveness.

References:

- <http://www.gbpn.org/reports/building-energy-efficiency-best-practice-policies-and-policy-packages>
- Levine et al (2012), *Building Energy Efficiency Best Practice Policies and Policy Packages*, Ernest Orlando Lawrence Berkeley National Laboratory. <https://china.lbl.gov/sites/all/files/gbpn-finaloct-2012.pdf>
- BPIE (2012), *Boosting Building Renovation, an Overview of Good Practices*.
- GBPN (2015), *Deep Building Renovation – International Policy Guidelines*.



## United States and Canada

Policy name: US building codes	Country/State/LGA: USA
Policy type:.* Regulation	<b>Policy sub-type:.*</b> Performance and prescriptive
Scope: New build and major renovation, residential and commercial	<b>Key points:</b> Building code governance in federal system Interaction between policies

Description:

### Base Codes

- The USA has two base energy codes:
  - International Energy Conservation Code (IECC), applies to all buildings
  - ANSI/ASHRAE/IES Standard 90.1 (ASHRAE Standard 90.1), applies to commercial buildings (which are considered all buildings other than single-family dwellings and multifamily buildings three stories or less in height).
- The development of these codes is undertaken by independent bodies (???) with input/recommendations from the Department of Energy (DOE)
- It is mandated (42 U.S. Code § 6833 - Updating State building energy efficiency codes) that upon update of the model codes:
  - DOE is required to review the new codes and make a determination as to whether the new code goes beyond the requirements of the previous version
  - In which case it triggers the requirement that the states review the provisions of their building codes regarding energy efficiency, and make a determination as to whether it is appropriate for them to revise their codes to meet or exceed the updated edition of the IECC within 2 years. A state can decline to adopt a residential energy code (but it cannot opt out of adopting the commercial code) by submitting a statement to the Secretary of the DOE detailing its reasons for doing so.
  - DOE is required to provide support to states and local governments for the adoption, implementation and compliance of/with the codes
- Through the Building Energy Codes Program (BECP), DOE plays a central role in the process, providing recommendations for upgrades to the ... and [technical assistance](#) to state and local governments to help facilitate the [adoption, implementation and compliance processes](#). This support also includes tracking [state adoption status](#), coordinating activities among stakeholders, technical analysis and the development of materials and tools (including those to help achieve, document and verify compliance with energy codes).

### Beyond Code

- Beyond the energy codes are stretch, green, or sustainable codes and rating programs (and associated labelling programs). Progressive states and local jurisdictions are going beyond baseline energy codes and adopting 'beyond code' programs either as minimum codes or as a component of a program that provides incentives to those who comply. 'Beyond code' codes include:
  - locally developed green building codes and programs, which often require a certain percentage above base codes (termed 'stretch codes')
  - ASHRAE Standard 189.1 *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*
  - ICC 700 *National Green Building Standard*, a residential beyond-code program
  - International Green Construction Code (IgCC)
  - Energy Star for New Homes

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- U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) rating system
  - Living Building Challenge
  - GreenPoint Rated system, a program of Build it Green
  - EarthCraft House
  - HERS Index
  - NBI Core Performance Guide
- Regional and national codes provide peer-reviewed, nationally vetted documents that save jurisdictions the time and effort of developing and maintaining codes locally. Many of these programs are third-party verified and maintained by non-profit organizations.

#### Incentives

- Although mandated in certain jurisdictions, there are a number of incentives available to build to stretch code, including: expedited permitting; training, support and financial incentives under the Energy Star Homes program; federal tax benefits; rebates for installing high efficiency HVAC; incentives to increase insulation and reduce air leakage through the MassSave program; utility subsidies.
- An Energy Efficient Mortgage (EEM) is a mortgage that credits a home's energy efficiency in the mortgage itself, either by:
  - taking into account the ongoing cost savings of an already energy efficient house (i.e. in purchasing an energy efficient house, as verified by Energy Star certification)
  - or in purchasing an existing house that will have subsequent energy efficiency improvements made to it (allowing borrowers to include the cost of energy-efficiency improvements to an existing home in the mortgage, through taking into account the amount that will be saved in ongoing energy bills). Also called Energy Improvement Mortgages (EIMs).
- Both EEMs and EIMs typically require a home energy rating to provide the lender with the estimated monthly energy savings and the value of the energy efficiency measures — known as the Energy Savings Value. EEMs (and EIMs) are sponsored by federally insured mortgage programs (FHA and VA) and the conventional secondary mortgage market. Lenders can offer conventional EEMs, FHA EEMs, or VA EEMs.
- Federal tax credits exist for certain Energy Star rated products including:
  - 30% for: geothermal heat pumps; small residential wind turbines; solar PV; fuel cells
  - 10% up to \$500 or specified amount between \$50-\$300 for: biomass stoves; heat pumps; certain HVAC equipment; insulation; cool roofs; water heaters; windows, doors and skylights
- Jurisdictions offer additional incentives such as:
  - Expedited permitting is used as an incentive where projects that design and build to high performance codes are fast tracked through development approval processes.
  - Some jurisdictions offer reimbursements for costs associated with high performance rating certification (such as LEED certification fees)
  - Reduced land tax, or land tax credits
  - Income tax credits
  - Utility rate reductions
  - Grants

#### Notable differences between the Australian and US systems:

- In the US the energy codes are standalone codes and are developed by separate independent bodies. These standalone codes are called up along with other codes (such as fire, electrical, structural, and plumbing) by the states. In Australia these codes are combined and developed by the one body (the Australian Building Code Board).
  - In the US the Department of Energy (DOE) has a statutory obligation to support the development, adoption and implementation of the energy codes. This includes submitting proposals for updates to code development bodies, and aiding code adoption and implementation by states through provision of technical assistance including the
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development and distribution of tools, materials and analyses. This includes a centralised role in providing compliance support. In Australia the federal government has no such requirement, while federal government agencies do have carriage of a number of programs, it is the responsibility of the states to manage adoption and implementation as they see fit.

- In the US there are statutory requirements for the states to consider the adoption of the base codes. Within 2 years of a new version of the code being released, states are required to review the new provisions and assess whether they go beyond the provisions in the state codes. If they are assessed as going beyond the existing codes, the states must either update their codes to equivalent or better, or provide reasoning as to why they have decided not to.

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Market barriers/failures addressed?

- Split incentives (between builders and owners/purchasers)

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References:

- [www.energycodes.gov](http://www.energycodes.gov)
  - DOE (???), *Going Beyond Code*
  - [www.energystar.gov](http://www.energystar.gov)
  - <http://bcapcodes.org/wp-content/uploads/2015/12/CPA-White-Paper.pdf>
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<b>Policy name:</b> <ul style="list-style-type: none"> <li>• Building Code Compliance</li> </ul>	<b>Country/State/LGA:</b> <ul style="list-style-type: none"> <li>• USA</li> </ul>
<b>Policy type:*</b> <ul style="list-style-type: none"> <li>• Building Code</li> </ul>	<b>Policy sub-type:*</b> <ul style="list-style-type: none"> <li>•</li> </ul>
<b>Scope:</b> <ul style="list-style-type: none"> <li>• New and upgraded commercial and residential</li> </ul>	<b>Key points:</b> <ul style="list-style-type: none"> <li>• Code compliance</li> <li>• State responsibility supported by federal government</li> <li>• Private and public sector initiatives/partnerships</li> </ul>

**Description:**

Federal Government

- Building code compliance is the responsibility of the States in the US, however it is also supported by the federal government, as part of its responsibilities regarding model code development and implementation (42 USC 683)(see US Building Code case study).
- The federal government has linked code compliance requirements with funding provided to the States. Following the global financial crisis, the American Recovery and Reinvestment Act (ARRA) 2009 was passed to stimulate the national economy, and included \$3.1 billion (in addition to existing funding), linked to commitments from states to update their building energy codes and to develop plans to achieve greater rates (90%) of compliance by 2017.
- Through the Building Energy Codes Program (BECPP), the US Department of Energy (DOE) provides [technical assistance](#) to state and local governments to help facilitate the adoption, implementation and compliance process for the model building codes. In regards to compliance this includes:
  - Development and provision of compliance resources, such as:
    - Compliance software REScheck and COMcheck, which are updated with each code revision and available for free download
    - Compliance checklists to support state energy code compliance evaluations, can be customized by states and local jurisdictions to cover state amendments to the codes
    - Guidance on evaluating and measuring compliance with energy codes.
  - Identifying barriers to compliance and using this information to inform the code development process.
  - Disseminating best practices for documenting and verifying compliance.
- To inform above, DOE financed the Pacific Northwest National Laboratory to develop a protocol which was delivered through a series of pilot studies looking to:
  - Confirm actual compliance rates. Evaluation studies, until now, lacked a consistent methodology;
  - Assist in determining patterns of compliance, i.e., what code requirements are consistently met and those which are often missed;
  - Create comprehensive protocols to follow, including detailed checklists, to evaluate compliance for each individual requirement;
  - Produce best practices for building departments to follow when designing training programs that target the most difficult compliance requirements.
- DOE is now looking to formally evaluate residential energy code compliance across the United States, with Commercial Buildings to follow.

Industry

- An industry advocacy organization, Building Codes Assistance Project (BCAP) also works in this space and promotes the adoption, enforcement, and compliance of building energy codes and standards.
  - BCAP was established in 1994 as a joint initiative of the [Alliance to Save Energy](#), the [American Council for an Energy-](#)

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[Efficient Economy](#), and the [Natural Resources Defence Council](#).

- Following the ARRA, BCAP launched the [Compliance Planning Assistance \(CPA\)](#) Program with the aim of developing compliance evaluation procedures (which are being refined through the use of pilot studies) as a centralised resource for states, making more economically feasible and ensuring comparability of evaluations between states.
- BCAP receives partial funding from DOE for the [CPA](#) to work directly with states to help them take practical steps towards achieving compliance with the model energy codes through preparation of:
  - Gap Analysis Report, which documents the state’s existing energy code infrastructure to assess the current gaps, identify best practices, and offer initial recommendations for improvement.
  - Strategic Compliance Plan, which develops targeted, state-specific plan with practical near- and long-term action items to move the state towards full energy code compliance.

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In what way(s) does this represent best practice?

- Code compliance regime including research studies, utility compliance support, training and outreach programs.

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References:

- Tyler et al, 2016, *How do Enhanced Code Requirements Influence Compliance and Building Efficiency? A Massachusetts Case Study*, ACEEE Summer Study on Energy Efficiency in Buildings
  - ACEEE, 2016, *State Energy Efficiency Scorecard*
  - <https://www1.eere.energy.gov/wip/solutioncenter/pdfs/Policies%20and%20Procedures%20for%20Enhancing%20Code%20Compliance.pdf>
  - <http://bcapcodes.org/wp-content/uploads/2015/12/Iowa-Energy-Code-Evaluation-Pilot-Study-Final-Report.pdf>
  - <http://bcapcodes.org/wp-content/uploads/2015/12/CPA-White-Paper.pdf>
  - <https://www.energycodes.gov/sites/default/files/documents/MeasuringStateCompliance.pdf>
-

Policy name: ENERGY STAR	Country/State/LGA: USA
Policy type:*	<b>Policy sub-type:*</b>
Voluntary action	Engagement, information, tools and assistance, training, capacity building
Scope:	<b>Key points:</b>
<ul style="list-style-type: none"> <li>All</li> </ul>	<ul style="list-style-type: none"> <li>Voluntary high energy performance program</li> <li>Number and variety of products covered</li> <li>Providing the basis/benchmark for other policies</li> </ul>

Description:

ENERGY STAR

- Run by the US Environmental Protection Agency (with some initiatives in combination with the Department of Energy).
- ENERGY STAR is a voluntary high performance labelling system including equipment (appliances, electronics, lighting), building products (windows, insulation, insulated flexible ducting), buildings (new and refurbished residential and commercial), and building energy management tools. The program now covers more than 50 kinds of products delivers resources (technical information, tools and support) for the uptake of energy-efficient solutions and best management practices, including supporting programs, such as Home Performance with ENERGY STAR, and Building Performance with ENERGY STAR (for commercial buildings).
- ENERGY STAR was introduced in 1992 as a voluntary labelling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labelled products. 1995 expanded the label to additional office equipment products and residential heating and cooling equipment, as well as residential buildings. In 1996, EPA partnered with the US Department of Energy for particular product categories and expanded into building ratings ...
- The program now has a large range of programs and tools including:
  - ENERGY STAR Portfolio Manager - a building energy rating program that allows buildings to benchmark their performance.
  - ENERGY STAR Buildings Label - is available for buildings that score 75 or higher using the Portfolio Manager rating, meaning one that sits within the top 25% of buildings of its type. Provides recognition for energy management efforts and incentivises improvement of efficiency to attain recognised symbol of high performance.
  - ENERGY STAR for Homes - is an asset rating high performance labelling program for new homes. Home Performance with ENERGY STAR program
  - ENERGY STAR Target Finder allows for modelling of building performance during project design used for code compliance. Allows comparison of performance between design and operational building stages, making designers and builders more directly accountable for as built performance and code compliance.
  - Support programs utilising products above include Home Performance with ENERGY STAR, and Building Performance with ENERGY STAR (for commercial buildings).

Platform for other programs

- ENERGY STAR has become the basis of ratepayer funded energy efficiency programs and mandatory building disclosure policies. It provides a platform for utilities, state agencies, and other organizations implementing energy efficiency programs. The EPA supports the use of ENERGY STAR by energy efficiency programs, through development of tools and support strategies to aid program design, uptake, reduce program costs and timelines, and ensure efficacy and rigour of resulting programs. Examples of programs that leverage ENERGY STAR include:
  - Federal tax incentives - tax incentives have been included as an incentive under the program. Including for the installation of individual pieces of equipment, systems and reaching overall high performance building standards.

- 
- State and local residential upgrade programs – including auditing and upgrades utilising the Home Performance with ENERGY STAR (HpwES) (e.g. New York State through NYSERDA, Residential Energy Efficiency Program).
  - Upgrade to public buildings – including benchmarking using ENERGY STAR Portfolio Manager and labelling ENERGY STAR certification (for example Vermont, with support from ‘think and do tank’ Efficiency Vermont, school benchmarking program where all public K-12 schools in the state were benchmarked using ENERGY STAR Portfolio Manager, with nearly half eligible to apply for ENERGY STAR certification).
  - Utility driven programs – encourage upgrades to energy consuming equipment using the ENERGY STAR Products Programs and HpwES (eg EmPOWER Maryland).
  - Code compliance - ENERGY STAR Target Finder is used to demonstrate performance code compliance in some US States (e.g. Washington DC). Allows comparison of performance between design and operational building stages, making designers and builders more directly accountable for as built performance and code compliance. Is coupled with mandatory benchmarking in some states.
  - Mandatory benchmarking – utilising ENERGY STAR Portfolio Manager (e.g. Washington has yearly mandatory benchmarking requirements for commercial buildings).
- 

Evidence of effectiveness/cost effectiveness?

- Delivered energy and cost savings across the country, saving businesses, organizations, and consumers \$24 billion in 2012 alone.
  - Estimated that the program has prevented emissions of nearly 120 million metric tonnes of CO<sub>2</sub>.
  - Six studies have found that ENERGY STAR buildings carry rental, sales, and occupancy premiums.
- 

In what way(s) does this represent best practice?

- Voluntary high energy performance program
  - Number and variety of products covered
  - Providing the basis/benchmark for other policies
- 

References:

- Levine et al (2012), *Building Energy Efficiency Best Practice Policies and Policy Packages*, Ernest Orlando Lawrence Berkeley National Laboratory. <https://china.lbl.gov/sites/all/files/gbpn-finaloct-2012.pdf>
  - [www.energystar.gov](http://www.energystar.gov)
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<b>Policy name:</b> <ul style="list-style-type: none"> <li>• Building code</li> </ul>	<b>Country/State/LGA:</b> <ul style="list-style-type: none"> <li>• USA/Massachusetts</li> </ul>
<b>Policy type:*</b> <ul style="list-style-type: none"> <li>• Regulation and voluntary standard</li> </ul>	<b>Policy sub-type:*</b> <ul style="list-style-type: none"> <li>• Performance and prescriptive options</li> </ul>
<b>Scope:</b> <ul style="list-style-type: none"> <li>• New and upgraded commercial and residential</li> </ul>	<b>Key points:</b> <ul style="list-style-type: none"> <li>• Stretch code (beyond code)</li> <li>• Code compliance</li> </ul>

**Description:**

- Massachusetts updates their base energy code every 2-3 years in line with the International Energy Conservation Code (IECC).
- They also have a 'stretch code' which aims to achieve a 20% improvement over the base code. The Stretch Energy Code can be legally adopted by a municipality, and affects the design and construction of: (a) new residential buildings of 3 stories or less; (b) portions of existing residential buildings undergoing renovation or addition; (c) certain new commercial buildings.
- Have established the Code Compliance Support Initiative, including research studies, utility compliance support, training and outreach programs. The Mass Save Energy Code Technical Support Initiative provides Massachusetts code officials, design professionals, builders, subcontractors, material and equipment suppliers and others, with valuable building energy code compliance training, technical support, and documentation tools.
- Although essentially mandated in certain municipalities, there are still a number of incentives available to build to stretch code, including: training, support and financial incentives under the Energy Star Homes program; federal tax benefits; rebates for installing high efficiency HVAC; incentives to increase insulation and reduce air leakage through the MassSave program; utility subsidies.

**Market barriers/failures addressed?**

- Information, financial

**Apparent theory of action?**

- Indirect cost/benefit
- Thou shalt

**In what way(s) does this represent best practice?**

- Example of beyond code.
- Code compliance regime including research studies, utility compliance support, training and outreach programs.

**References:**

- Tyler et al, 2016, *How do Enhanced Code Requirements Influence Compliance and Building Efficiency? A Massachusetts Case Study*, ACEEE Summer Study on Energy Efficiency in Buildings
- ACEEE, 2016, *State Energy Efficiency Scorecard*

<b>Policy name:</b> <ul style="list-style-type: none"> <li>Greener Greater Buildings Plan</li> <li>Retrofit Accelerator</li> </ul>	<b>Country/State/LGA:</b> <ul style="list-style-type: none"> <li>USA/New York State/New York City</li> </ul>
<b>Policy type:*</b> <ul style="list-style-type: none"> <li>Regulation and voluntary action</li> </ul>	<b>Policy sub-type: *</b> <ul style="list-style-type: none"> <li>Information disclosure</li> <li>Engagement, information, tools and assistance, training, capacity building</li> </ul>
<b>Scope:</b> <ul style="list-style-type: none"> <li>Existing commercial</li> </ul>	<b>Key points:</b> <ul style="list-style-type: none"> <li>Mandatory auditing requirements</li> </ul>

**Description:**

- New York City has committed to reduce citywide GHG emissions by 80 percent from 2005 levels by 2050, with interim targets to reduce citywide GHG emissions by 40 percent by 2030 and to reduce its building-based GHG emissions by 30 percent by 2025.
- Under the City’s Greener, Greater Buildings Plan, have introduced laws intended to assist building owners and operators in better understanding how their buildings use energy. Requiring all buildings greater than 50,000 square feet (4,645m<sup>2</sup>) in floor area to benchmark their energy use annually ([Local Law 84](#)), conduct energy audits and retro-commissioning once every 10 years ([Local Law 87](#)), and install sub-meters and upgrade lighting in non-residential buildings by 2025 ([Local Law 88](#)).
- Retrofit Accelerator is aimed at buildings required to comply with these laws and provides assistance to: coordinate compliance with Local Law 87 (Energy Audit and Retro-Commissioning); interpret the Local Law 84 benchmarking and Local Law 87 energy audit results; identify energy and water efficiency upgrades best suited for the building; convert to cleaner heating fuels; obtain cost estimates; understand financing options and navigate financing processes; select appropriate contractors; complete the necessary permitting; connect with education and training programs; monitor results.

**Market barriers/failures addressed?**

- Information and financial barriers.

**Apparent theory of action?**

- Targets include an element of social norming – “we’re all in this together and all need to act”.
- Mandatory auditing and benchmarking forces the owner to understand how much energy is being used (informing), but also how that compares with others (norming). Audits provide specific and tailored actions and opportunities to address carbon abatement opportunities and may (should) provide a financial business case to support those opportunities. The underlying theory is that, if presented with relevant targeted information, and some social pressure, owners will act in their own and the wider public interest.
- Mandatory retro-commissioning and lighting upgrades mandate action, presumably on the grounds that a) they are necessary; b) they are cost effective and c) they are important and not expected to happen, at least sufficiently, without mandation.

**In what way(s) does this represent best practice?**

- A comprehensive approach with clear long-term directions and targets; mandatory elements; targeted (and mandated) information provision.

**References**

- [retrofitaccelerator.cityofnewyork.us/about](http://retrofitaccelerator.cityofnewyork.us/about)

Policy name: Comprehensive Energy Efficiency Program for Existing Buildings	Country/State/LGA: USA/California
Policy type: Market regulation	<b>Policy sub-type:</b> Information disclosure
Scope: Existing commercial buildings	

Description:

- California passed legislation AB 758 in 2008 requiring the development of a building performance rating and labelling program. Requirements were developed and adopted in 2013 that mandated owners or operators of non-residential buildings greater than 50,000 sq. feet (subsequently lowered to 5,000 square feet), to disclose building energy data at the point of sale, lease, financing or refinancing of a property.
- California subsequently passed Assembly Bill 802 in 2015 requiring utilities to provide whole-building energy use information to building owners, significantly simplifying the process of data collection. It mandated Californian utilities (including electric, gas, steam, and fuel oil) maintain 12 consecutive months of energy usage data and provide this data within four weeks of a request by any building owner.
- Disclosure is satisfied through the development and disclosure of reports generated by uploading building energy usage data to the ENERGY STAR Portfolio Manager website. Practically this is done by setting up an account on the website and authorizing the utility company to release data.

Market barriers/failures addressed?

- Information asymmetry

In what way(s) does this represent best practice?

- This represents best practice in regards to utility data access, streamlining the process significantly for building owners.

References:

- <http://www.gbpn.org/reports/building-energy-efficiency-best-practice-policies-and-policy-packages>
- GBPN (2015), *Deep Building Renovation – International Policy Guidelines*.
- <http://www.buildingrating.org/jurisdiction/California>

Policy name: City of Vancouver Zero Emissions Building Plan	Country/State/LGA: Canada/Vancouver
Policy type: Policy package including regulation, financial incentives and capacity building	<b>Policy sub-type:</b> Hybrid
Scope: All new construction	

Description:

- Vancouver is the first North American city to develop a detailed roadmap to achieve a target of zero emissions in all new construction by 2030.
- Has taken a stepped approach with targets of 70% emissions reduction in new construction by 2020, and 90% reduction by 2025.
- The plan includes a number of initiatives:
  - The requirement for Passive House certification for all new city owned buildings.
  - The Vancouver Affordable Housing Agency has a requirement that all new developments for affordable housing are assessed against Passive House standards.
  - The requirement that low-rise multi-unit residential building rezoning meet the passive house thermal load intensity target of 15 kWh/m<sup>2</sup>/year by 2020. Which is to be extended to all low-rise residential by 2025.
  - Financial mechanisms to catalyse the uptake of low emission construction.
  - Capacity building initiatives including development of a Centre of Zero Emission Building Excellence to facilitate information/knowledge sharing and development of skills required to support the market.
- This is accompanied by other policies including:
  - Green rezoning policy requires rezoning of large commercial and multi-unit residential projects to achieve Passive House certification or meet stringent thermal energy demand or greenhouse gas intensity targets.
  - Thick wall exclusion in the code, which allows for the thickness of exterior walls (where insulation levels exceed minimum requirements) to be excluded from floor space ratio calculations.

Market barriers/failures addressed?

- Information asymmetry
- Split incentives

In what way(s) does this represent best practice?

- Detailed roadmap to achieve zero emissions buildings for new construction.
- Policy package including a number of complementary initiatives.

References:

Frappe-Seneclauze et al (2016), *Accelerating Market Transformation for High-Performance Building Enclosures*

Policy name: US Department of Energy High Insulating Windows Volume Purchase Program	Country/State/LGA: USA
Policy type: Combination of financial incentive and voluntary action/behaviour change	<b>Policy sub-type:</b> Positive financial incentive combined with engagement, information, tools and assistance, capacity building
Scope: New and existing buildings in the residential and commercial sectors	

Description:

- Initial research undertaken by DOE found that choice of windows could directly affect energy loads in a building by up to 57%, equating to \$133 billion in electricity annually, and almost 14% of the US total energy use.
- Up to that point, triple glazed windows had been available on the American market for over 30 years as a niche product, and were not cost-effective for consumers, representing less than 2% of the total volume of windows being sold in the US. At the same time the penetration of triple glazed windows in Europe was much higher, thought to be due to code requirements and higher energy prices.
- The US Department of Energy set up the High Insulating Window Volume Purchase (WVP) Program in 2009 with the primary goals of:
  - Reducing the average incremental costs of high performing windows with a target of \$4/ft<sup>2</sup> beyond ENERGY STAR.
  - Raise public awareness of the value and availability of high performing windows.
- The program aligned with a broader DOE strategy of ‘market priming’ to:
  - Draw new products, practices and services into the market faster at scale.
  - Provide technical support to ENERGY STAR for new higher-tier products.
- The program was released along with a competitive grant round to support manufacturers to invest in production requirement needed to manufacture triple glazed windows at competitive prices.
- The program covered windows with a whole window U-value no greater than 1.25 (metric) and low-E storm windows, for both the residential and commercial sectors.
- The approach was as follows:
  - Develop specifications for approved high performance windows.
  - Go out to market requesting manufacturer bids for windows that meet these specifications.
  - Enter agreement with manufacturers meeting specifications.
  - Develop a website from which customers can access and purchase these products.
  - Track sales of products.
  - Accompanying information campaign to raise awareness of the program and benefits of high performing windows.
- Over 60 window vendors participated.
- Window sales through the program were 40,479 windows, with an overall value of greater than \$9.7 million USD.
- Market penetration of triple glazed windows increased from 6% to 13-15% (an increase of over 100%) in cold regions. Notwithstanding the fact that new builds decreased by 50% over the same period due to the Global Financial Crisis.
- WVP was then used to further leverage the ENERGY STAR program, with ENERGY STAR releasing an EPA Most Efficient program for window technology in 2013, recognising the most efficient products among those that qualify for ENERGY STAR, in line with the minimum requirements set under WVP.
- DOE continues to establish goals in their multi-year program plan and support research and development (R&D) to

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improve residential window performance by 70 percent by 2020.

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Market barriers/failures addressed?

- Information asymmetry
  - Financial barriers
- 

Evidence of effectiveness/cost effectiveness?

- Cost premiums (\$/square foot) beyond ENERGY STAR windows decreased over the life of the program as follows:
    - 2008 = \$6.78 - \$10.00
    - 2010 = \$5.83 - \$7.23
    - 2012 = \$1.59 - \$5.83
  - Market penetration of triple glazed windows increased from 6% to 13-15% (an increase of over 100%) in cold regions.
  - ENERGY STAR established a Most Efficient windows program in alignment with the minimum requirements set under the WVP ensuring public awareness of high performing products is maintained.
- 

In what way(s) does this represent best practice?

- Successful market transformation policy
- 

References:

- [www.pnnl.gov/main/publications/external/technical\\_reports/PNNL-22183.pdf](http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22183.pdf)
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## Asia Pacific

Policy name: Tokyo Cap-and-Trade Program	Country/State/LGA: Japan/Tokyo
Policy type:.* Financial incentives	<b>Policy sub-type:.*</b> Hybrid
Scope: Large commercial and industrial buildings	<b>Key points:</b> Urban cap-and-trade scheme

### Description:

- Tokyo has a citywide GHG emissions reduction target of 25% (and energy consumption of 20%) below 2020 levels by 2020, and a building-specific CO2 reduction target of 17% from commercial and industrial sectors by 2020. To achieve this, Tokyo Metropolitan Government introduced the Tokyo Cap-and-Trade Program (TCTP) in 2010. It is the world's first urban cap-and-trade scheme.
- Applies to buildings with energy consumption greater than 1500 kilolitres of crude oil equivalent. Which covers approximately 1400 commercial buildings (mainly offices) and 300 industrial buildings (factories, and water/sewerage treatment plants), and accounts for 40% of total CO2 emissions from those sectors.
- Buildings are required to achieve emissions reductions from the baseline year of 6% for industrial buildings and 8% for commercial buildings by the end of the first 5 year compliance period (i.e. 2015), and 15% or 17% by the end of the second compliance period (i.e. 2020).
- If the target is not met through efficiency measures, external carbon credits must be procured to offset the difference. Recognised credits include:
  - Excess credits from other buildings/facilities in the program
  - Credits from CO2 reductions voluntarily achieved by small and medium buildings
  - Credits from generation of renewable energy
  - Credits from similar programs in different jurisdictions
- Where emissions reductions are not met, buildings are required to reduce emissions by 1.3% times the target shortfall, and if not met are fined up to 500,000 yen and are required to pay for the purchase price of credits to offset the shortage.
- The program has a stringent data collection and reporting requirement, with all data publically disclosed.

### Market barriers/failures addressed?

- Externalities, pricing carbon
- Information asymmetry

### Evidence of effectiveness/cost effectiveness?

- By 2012 the TCTP had achieved a 22% total reduction from baseline emissions.

### In what way(s) does this represent best practice?

- It is the only urban cap-and-trade scheme in the world

### References:

- C40, 2014, *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities*, [www.c40.org/blog\\_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report](http://www.c40.org/blog_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report)

Policy name: 2 <sup>nd</sup> Green Building Master Plan (GBMP)	Country/State/LGA: Singapore
Policy type:.* Market Regulation	<b>Policy sub-type:.*</b> <ul style="list-style-type: none"> <li>Information Disclosure</li> <li>Hybrid</li> </ul>
Scope: Existing commercial buildings	<b>Key points:</b> <ul style="list-style-type: none"> <li>Minimum performance requirements for existing buildings triggered at install or upgrade of HVAC</li> <li>Ongoing HVAC auditing</li> <li>Commercial building benchmarking</li> </ul>

**Description:**

- The 2<sup>nd</sup> Green Building Master Plan (GBMP) focuses on the performance of existing commercial buildings. It was enacted following announcement of the target of ‘greening’ at least 80% of building stock by 2030.
- It is part of a staged approach to improving the efficiency of building stock in Singapore, with 3 major policies being enacted under the Building Control Act to mandate minimum performance requirements for new and existing buildings.
  - 1<sup>st</sup> GBMP – enacted the Building Control (Environmental Sustainability) Regulations 2008, focused on improving efficiency in new builds and renovations that affect a gross floor area of 2000m<sup>2</sup> or more, by setting minimum standards.
  - 2<sup>nd</sup> GBMP – updated legislation in 2012 to green existing buildings to reach target of ‘greening’ at least 80% of building stock by 2030
  - 3<sup>rd</sup> GBMP – updated legislation in 2014 to require the phase in of mandatory disclosure for all buildings
- The 2<sup>nd</sup> GBMP for existing buildings requires:
  - Buildings to meet minimum Green Mark Certified standards at the point of installation or replacement of cooling systems.
  - Three-yearly energy audit of building cooling systems, ensuring the system continues to operate efficiently and comply with standards.
  - Annual mandatory submission of building consumption data which is used to benchmark the building stock, and is accessible by all building owners, allowing direct comparison and encouraging energy upgrades.
- Minimum standards and auditing requirements are applicable to large commercial and industrial buildings of at least 15,000 m<sup>2</sup>. Annual mandatory submission of building consumption data is a requirement for all commercial and industrial buildings.
- To avoid difficulty for building owners collecting and aggregating tenant utility bills and ensure data accuracy, Singapore has mandated that utility suppliers provide energy consumption directly to the Authority.

**Market barriers/failures addressed?**

- Information asymmetry

**Evidence of effectiveness/cost effectiveness?**

- Initial results at the end of the first year of benchmarking suggested that compliance rates were very high, around 99%.

**In what way(s) does this represent best practice?**

- Utilises point of HVAC upgrade as a trigger point for whole of building improvements
- Focus of cooling as the major energy usage in a building in tropical climate, including requirement for 3 yearly auditing of system to ensure meeting minimum standards
- Innovative benchmarking program for all commercial buildings, including data collection processes, by mandating that

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utilities provide energy data directly to Authority

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References:

- C40, 2014, *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities*, [www.c40.org/blog\\_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report](http://www.c40.org/blog_posts/c40-and-tokyo-highlight-city-actions-on-building-energy-efficiency-in-new-report)
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Policy name: Hundred Energy Efficiency Standards	Country/State/LGA: China
Policy type: Market regulation	Policy sub-type:
Scope: Appliances and equipment, residential, commercial and industrial sectors	

Description:

- MEPS were first introduced in China in 1989, covering an initial 8 high energy consuming household appliances.
- In 2012 China launched the Hundred Energy Efficiency Standards program to accelerate development of efficiency standards, with the aim of adopting 100 energy-saving standards by the end of 2012.
- Included standards for consumption limits of industrial processes, MEPS for products and equipment, standards for energy measurements, and energy management and auditing standards for commercial buildings.
- 109 new standards were developed by the end of 2012 and a second phase was agreed to with the aim of adopting another 100 new standards over 2014 and 2015.
- For MEPS this resulted in the adoption of 21 new and revised MEPS from 2012 to 2013, compared to 7 adopted from 2010 to 2011.
- China's MEPS program is now one of the largest in the world with a total of 57 MEPS (15 household appliances, 13 lighting, 14 industrial equipment, 5 office equipment and 10 commercial equipment).

Market barriers/failures addressed?

- Information asymmetry

In what way(s) does this represent best practice?

- Unprecedented acceleration of development of energy-saving standards.

References:

- Fridley et al (2016), *Impacts of China's 2010 to 2013 Mandatory Product Energy Efficiency Standards: A Retrospective and Prospective Look*, ACEEE Summer Study on Energy Efficiency in Buildings conference paper.

Policy name: Buildings Energy Efficiency Ordinance	Country/State/LGA: China/Hong Kong
Policy type: Market regulation	<b>Policy sub-type:</b> Hybrid (?) and information disclosure.
Scope: Commercial buildings, new and existing undergoing major renovations.	

Description:

- The Buildings Energy Efficiency Ordinance was made in 2010 and aims to drive energy efficiency through setting minimum codes energy audit requirements.
- Consists of the following:
  - Building Energy Code (BEC), which sets minimum standards for commercial buildings, both new construction and existing buildings undergoing major retrofits, for four building service installations: air-conditioning, electrical, lift and escalators, and lighting.
  - Energy Audit Code (EAC), which mandates that commercial buildings must undergo an energy audit every ten years on the above four building services, and upgrade services to meet minimum requirements. The audit report is then required to be displayed by the building.
  - Registered Energy Assessors (REA) are required to process the BEC certification and energy audit works required under the ordinance. The REA Regulation details the certification process and role of assessors.
- The Buildings Energy Efficiency Funding Scheme (2009 to 2012) was run in parallel and provided subsidies to building owners to conduct energy audits. The outcomes of this program included:
  - Provided subsidies for more than 6400 Buildings to undertake energy audits (1/7 of all commercial buildings in Hong Kong).
  - Stimulation of the audit and retrofit market.

In what way(s) does this represent best practice?

- Combination of minimum standards, auditing requirements and mandatory disclosure.

References:

- C40 Cities (2014), *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities*.

