



FINAL REPORT

Benefits of building regulation reform

From fragmentation to harmonisation



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Australian Building Codes Board
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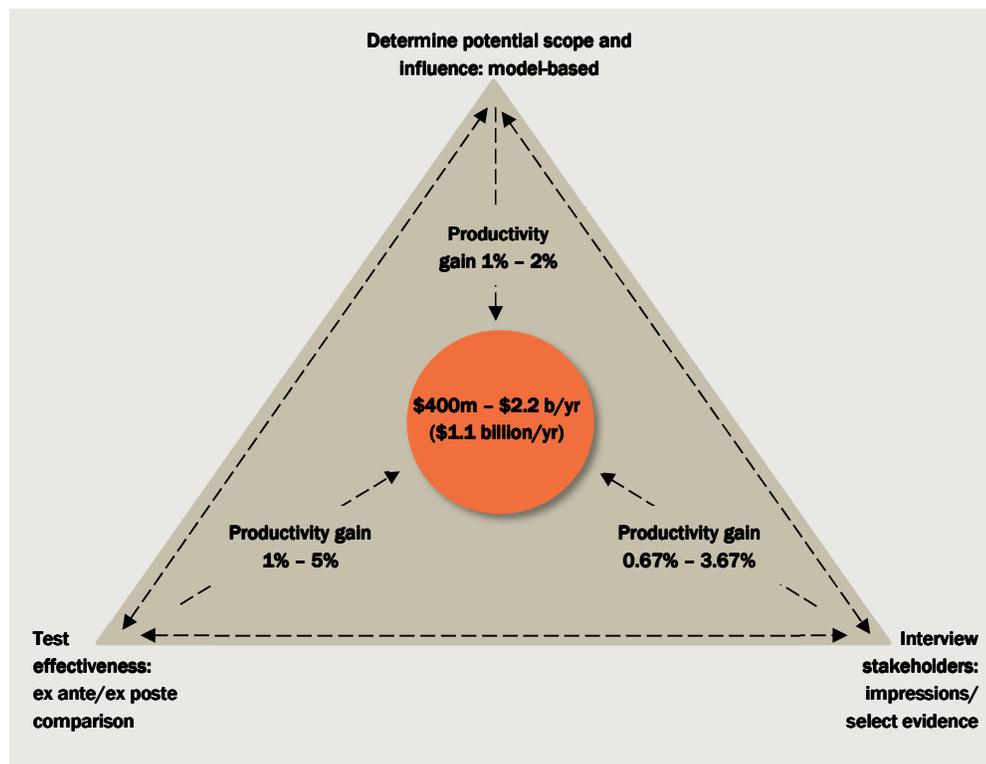
Executive Summary

Over the past 20 years, Australia's building regulations have experienced three major reforms — the development of a single national technical code in the early 1990s, the introduction of a performance based building code in the mid-1990s, and the integration of plumbing and construction into the National Construction Code in 2011.

TheCIE used a triangulation methodology to estimate the benefits to the Australian economy from these three major building regulation reforms. The methodology covered a literature review of previously published ex ante and ex poste studies of the reforms, TheCIE's in-house economic modelling of the Australian building industry, and discussions with a wide range of stakeholders around perceptions of the strengths, weaknesses, benefits and costs of these reforms.

Chart 1 illustrates the results of the study, with the triangulation converging on estimated benefits of approximately \$1.1 billion a year accruing to the Australian economy due to the suite of reforms to building regulations.

1 Reforms consistently point toward net benefits of over \$1 billion a year



Source: TheCIE.

Table 2 presents the breakdown of these estimated benefits, by each reform. Noticeably, performance based building regulations in the commercial sector account for the greatest proportion of the benefits, \$740 million a year.

2 Breakdown of estimated benefits by reform

Reform	Estimated attributable benefits, annually
Single national technical code	\$300 million
Performance based building code	\$780 million
▪ Commercial sector	▪ \$740 million
▪ Residential sector (housing)	▪ \$40 million
National Construction Code (plumbing)	\$60 million
Total national benefits annually	\$1.1 billion

Source: TheCIE.

Investigations of the benefits of performance-based methods in commercial construction projects found that there are definite savings arising from finding cheaper ways of doing things (lower costs — reduced inputs/output). Further, there are considerable, but less certain and less detectable, gains likely from innovation solutions that lead to more useable floor space per unit of input (increased output/input) and better quality, more attractive spaces per unit of output (increased quality/output).

The gains from the national BCA (single national technical code) alone were found to be approximately half the size of benefits from the performance-based reforms, although importantly, a performance-based code was not considered possible without a single national technical code. The benefits of a single national technical code were found to be reasonably similar across housing and commercial construction projects (Volume One projects compared to Volume Two projects).

Among stakeholders, there was reasonable consensus that only 50 per cent of the potential benefits of the national code and the performance-based standards had been realised. Importantly, this suggests that there may be opportunities to double the net benefits if certain system constraints, as discussed in chapter 5, could be lifted.

However, a number of stakeholders were concerned that contingent risks may be rising, relating to how performance based solutions are being implemented. Many cited New Zealand's expensive leaky buildings episode as a manifestation of what can happen with hidden, systemic problems. The challenge for policy makers appears to be how to retain and protect existing benefits from contingent risks while also achieving the full potential of the PBS.

In contrast to the BCA and PBS, the incremental productivity gains from the NCC are relatively small. Largely, this is a joint result of stakeholder assessments that the changes would predominantly affect the plumbing industry, and even then, on-site productivity improvements are expected to be reasonably small, and; plumbing costs are a relatively small proportion of total construction costs.

That said, all discussions around the NCC positively reflected its potential to improve the efficiency of plumbing regulation across Australia.

1 *Quantifying the benefits of building code reform*

Microeconomic reforms over recent decades are widely recognised as having been an important contributor to Australia's economic success. Microeconomic reform has boosted productivity and incomes and contributed to a more flexible economy that is more able to adapt to both international and domestic shocks. Regulatory reform has been an important element of the microeconomic reform agenda.

Reform of the building code

Reform of building regulation has been an important element of the microeconomic reform agenda over recent decades through an ongoing and incremental process. Key elements of the reform process have included:

- **Development and adoption of a single nationally consistent Building Code of Australia (BCA)** — under Australia's federal system of government, state and local governments are responsible for building regulations. Building regulations therefore evolved differently across different states and local government areas. Development of a nationally consistent building code has reduced, but not eliminated, differences across jurisdictions.
- **Introduction of performance-based requirements into the BCA (PBS)** — early versions of the BCA were highly prescriptive. That is, they specified how things were to be done. In the mid-1990s, a performance-based BCA was developed. Performance requirements specify mandatory levels of building performance and provide optional means of compliance for the designer or builder to decide how this is achieved. The approach allows more flexibility and innovation in building design and construction.
- **Consolidation of building and plumbing regulation into a single National Construction Code (NCC)** — this reform aimed to reduce inconsistency and overlap between the BCA and the Plumbing Code of Australia (PCA), streamline regulatory approaches across jurisdictions and increase the potential for sustainability provisions to be included in the construction industry.

The Australian Building Code Board (ABCB) has commissioned TheCIE to quantify the net benefits of these three major reforms. The study is focussed on examining:

- whether the reforms have delivered the benefits that were expected; and
- identifying any past, present or potential barriers that may be preventing the full benefits of reform from being realised.

Our approach

There is no single (or definitive set of) macro indicator(s) available to assist in assessing the benefits of building regulation reform over the past 25 years. Had the reforms delivered a Building Code that was performing well we might expect that affordable, innovative, safe, well-constructed and comfortable houses were being built and lived in. Claims on builders' insurance would be low, injuries and discomfort in homes would be low, bushfire, cyclone, flood and saline damage would be minimal and Australian could be leading the world in innovative design and building practices. However, the analytical complication is that even if all the above were true, we could not be sure it was the three building regulatory reforms that delivered all of these benefits.

Understanding the *counter-factual* — what would have occurred without the reforms — is the first step in estimating the benefits of building regulation reform. The benefits of these reforms are incremental benefits, and need to be assessed based on how the market would have been expected to evolve had there been no official reforms and against the alternative of separate building codes and standard setting across different states and local government areas for instance. Factors other than building regulations (such as commercial reputation) help contribute to the same objectives being pursued by the building regulatory reforms through better, more consistent and possibly cheaper standard setting and enforcement. These need to be accounted for.

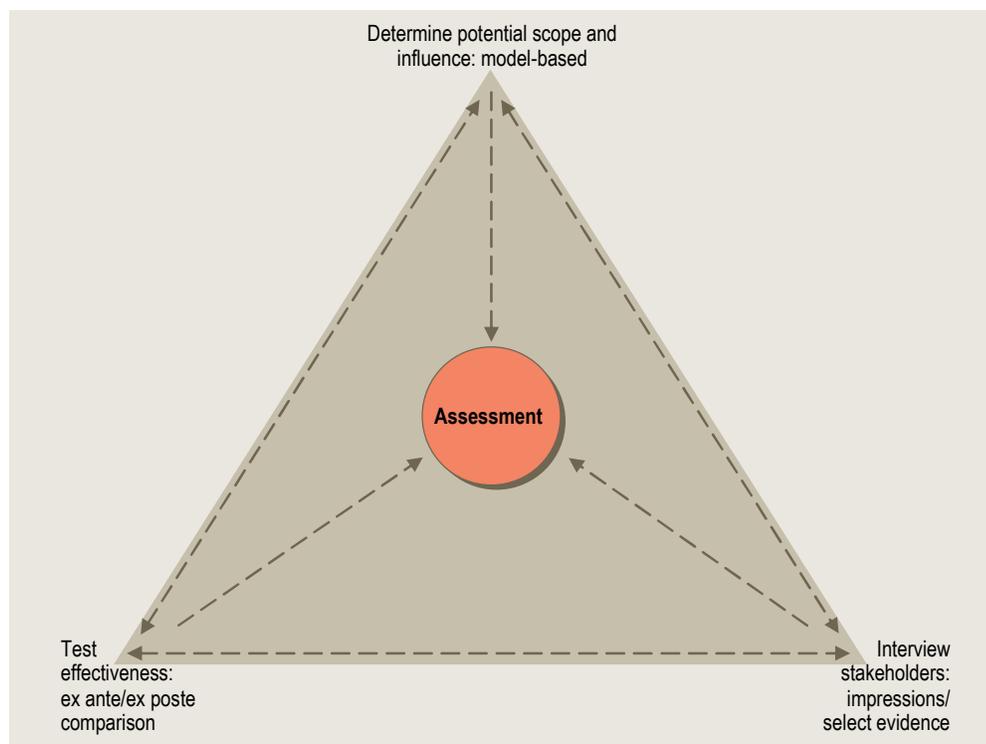
For the reasons above, a precise value assessment of the benefits of regulatory reform is difficult. However, through a process of triangulation it is possible to assess the consistency of evidence and to place confidence bounds around the possible net incremental economic benefits of building regulation reforms. Chart 1.1 illustrates the elements of this triangulation.

- The CIE's economic model of the Australian building sector is used in a 'tops-down' fashion to provide context and bounds around the potential scope of economic benefits that might arise from regulatory reform. The model represents the building sector as three of 56 in the Australian economy. It takes account of the input output linkages between sectors and so can be used to comprehensively assess economywide net benefits of changes in productivity caused by regulatory change. If successful, regulatory reform can be expected to create three main types of productivity improvement across different parts of the industry:
 - use of fewer inputs per unit of output: a cost saving;
 - creation of more output (floor-space) per unit of input: a quantity expansion; and
 - creation of more desirable spaces per unit of output: a quality improvement.
- A 'bottoms-up' summation of expected benefits contained in *ex ante* (before or expected) benefit cost assessments of various parts of the building regulatory reforms included in Regulation Impact Statements and other reports is also utilised. These published, expected results are then compared with the top-down estimates. A detailed *ex poste* (after or actual) comparison of the critical assumptions, parameters and expected outcomes of the *ex ante* studies is then utilised to see whether there are any obvious divergences between what was expected from the reforms and what may actually be attributed to the reforms. Such a process serves as a reality check

and is helpful in identifying why divergences may have occurred. This *ex ante-ex poste* comparison may also be used as a measure of effectiveness of the implementation of regulation reforms.

- Structured interviews with building industry stakeholders is an important final element to obtain qualitative impressions about the benefits of reforms and to elicit any important pieces of select hard evidence that may either support the other two quantitative elements or that may underpin broad impressions of the reforms and the reform process.

1.1 Triangulation methodology



Source: TheCIE.

All three estimation elements reinforce each other as indicated by the double-headed arrows in chart 1.1. Objectives of the original reforms in the *ex ante* analysis inform the *scope and potential* analysis for instance. Gaps in data in *scope and potential* and the *ex ante* analysis influence the structure of *stakeholder interviews* and findings from those interviews inform the other two avenues of analysis. Consistency between the three elements is used to narrow the bounds around estimates of benefits to focus in on an overall assessment of economic benefits.

2 History and objectives of reforms

Through the early periods of development to currently, the underlying objective was for the BCA to cover all of the minimum necessary technical standards for building construction in Australia to ensure health, safety — including structural safety and safety from fire — amenity and (from 2003) sustainability objectives are met.

Table 2.1 outlines the major regulatory and policy movements in building regulations since the 1950s when building regulations were highly fragmented, based on State/Territory boundaries and in some cases local government boundaries, through to the most recent reforms, the introduction of plumbing in to the BCA and the publication of the NCC.

2.1 The emergence of the national construction code

Reform and development work undertaken	Key reforms and reports delivered
1950s to 1960s — Fragmented and prescriptive building regulations based on State/Territory/LGA boundaries	
The Interstate Standing Committee on Uniform Building Regulations (ISCUBR) formed through interstate agreement to pool resources to improve national building regulations. The first piece of work was to draft a model technical code for building regulations.	Australian Model Uniform Building Code (AMUBC) was developed which included both technical and administrative arrangements.
1970s to 1993 — Progressive introduction of nationally consistent building regulations	
AMUBC, released in 1970, was designed as a reference document for each State and Territory to base future building regulations on. Given the limited uptake of AMUBC, the Australian Uniform Building Regulations Coordination Council (AUBRCC) was established in 1980 to develop a national building code, the Building Code of Australia (BCA).	First version of the BCA released in 1988, but only adopted by WA in 1989.
Building Regulatory Review Taskforce (BRRT) was established in 1989 to identify weaknesses of building regulations and the lack of national consistency.	The BRRT report published in 1991 outlined the impacts of fragmentation in building regulations and recommendations for national reform, including a performance-based, national BCA.
In 1990 AUBRCC commissioned the development of a National Model Building Act, with the similar objective to the AMUBC, to guide the reform of existing State and Territory building legislation and enhance national uniformity.	The second edition of the BCA was released in 1990, and adopted by all States and Territories by 1993. The National Model Building Act was published in November 1991, but was not enacted by the States and Territories. Elements of the Act were subsequently included in State and Territory legislation.
1996 to 2000 — Introduction of national performance-based building regulations	
ABCB was established in 1994 on the recommendations of BRRT and worked towards a redeveloped performance-based BCA.	The first performance-based BCA was published in 1996 and adopted by all States and Territories by 1997.

(Continued next page)

2.1 The emergence of the national construction code (Continued)

Reform and development work undertaken	Key reforms and reports delivered
2002 onwards – Plumbing regulation reform and the introduction of the National Construction Code	
National Plumbing Regulators Forum was established in 2002, with the view to developing a performance-based plumbing code, similar in structure to the BCA	Sustainability included as a BCA objective in 2003 Plumbing Code of Australia released in 2004 and adopted by ACT, Qld, SA, Tasmania and Victoria.
In 2007, the House of Representatives Standing Committee on Environment and Heritage recommended consideration of a more formal organisation overseeing the consolidation and national consistency of plumbing regulations.	In March 2008, the Business Regulation and Competition Working Group (BRCWG) reviewed the arguments and analysis for a National Construction Code (NCC). In July 2008, COAG agreed to develop the NCC, including building, plumbing, electrical and telecommunications.
In July 2009, COAG agreed to the implementation of a NCC, the first stages of which were to integrate the PCA with the BCA.	The PCA was reviewed in 2010 as part of the process for developing a NCC. April 2011 was the first release of the NCC, including the PCA as volume three. Subject to transitional arrangements, all States and Territories agreed to the adoption of the NCC by October 2012.

Source: Compiled by TheCIE from ABCB and BPIC submission to PC 2004 report.

Single national building code

Constitutional responsibility for the construction industry lies with Australian State and Territory governments. However, noting the difficulties associated with eight fragmented and potentially inconsistent construction codes and regulatory systems, work towards a nationally consistent building code began as far back as the 1960s, with the formation of the Interstate Standing Committee on Uniform Building Regulations (ISCUBR). The major piece of work in this process was the publication of the Australian Model Uniform Building Code (AMUBC) released by the Commonwealth government in the early 1970s. The AUMBC was developed as a guide for all States and Territories to review and rework their individual building legislation, with the aim of having some level of national consistency across both the technical and administrative building legislation across Australia.

However, the adoption of AMUBC was low, with State and Territory governments widely choosing not to adopt the model Code and instead continuing independent reviews and reforms of their jurisdiction based legislation.

Following the unsuccessful introduction of the AUMBC and with growing national recognition of the benefits of a nationally consistent code, in the early 1980s an inter-government agreement established the Australian Uniform Building Regulations Co-ordinating Committee (AUBRCC). The main role of AUBRCC was to facilitate a co-operative Code development process with the States, Territories and the Commonwealth Government. To this end, AUBRCC released the first national Building Code of Australia (BCA) in 1988, but Western Australia was the only jurisdiction to adopt the BCA.

The second edition of the BCA was released in 1990, following a review and refinement process. This version was progressively adopted by all States and Territories — albeit with significant levels of variations by jurisdictions — by 1993.

Over the years since the development of the BCA, many reports have outlined the benefits, as well as some potential costs, of a single nationally consistent BCA. Identified benefits of a nationally consistent BCA have included (PC, 2004):

- lower compliance costs for designers and builders working across multiple jurisdictions;
- improved compliance with the BCA;
- a larger market for building products;
- transferability of building designs;
- transferability of skills; and,
- savings in code development costs (PC, 2004).

Further, in its 2004 review of Australian Building Regulation, the Productivity Commission found that:

National consistency is the most significant national reform initiative with the objective of improving efficiency. The national framework allows for variations by regions with different characteristics, such as cyclone risk. Continuing the pursuit of national technical standards is important (p54).

Transition beyond a single national technical code

The introduction of a single, nationally consistent technical code was only the first step in wider reforms across the Australian building industry. In 1989, the Building Regulation Review Taskforce (BRRT) was commissioned to review Australia's building regulations and report on the strengths and weakness of the system, especially in terms of national consistency. The BRRT report, published in 1991, outlined a number of recommendations, some (not all) of which have been subsequently adopted over the following years, and decades (BRRT, 1991).

- The development of a hierarchy of technical requirements including:
 - national goals of building regulation outlined in legislative principles;
 - performance-based national building code;
 - a suite of building standards to make up the deemed-to-satisfy provisions;
 - fire safety requirements to provide the basis for a performance-based approach to fire safety; and
 - national accreditation for building products, systems and techniques.
- The establishment of the Australian Building Regulation Corporation (which became the Australian Building Codes Board) with responsibility for:
 - achieving building regulation reform, including the hierarchy of technical requirements;
 - national management of building regulation in Australia, including arrangements required for ongoing operation of a national system;

- sponsorship of research required to underpin ongoing regulatory reform and facilitate innovation and technological change in building and construction.
- State and Territory governments to agree to a common set of principles that would stimulate consistency in building control legislation, including:
 - the use of the BCA as the basis for all technical building regulations;
 - development of suitably qualified market for private building certifiers;
 - a uniform or national system for accreditation of building products, systems and techniques;
 - liability limitation and adoption of nationally consistent dispute resolution;
- The use of private certification and facilitation of cost effective building insurance to be developed to assist with professional certification.
- A separate system for the regulation of housing construction, including the development of a 'National Housing Code', a 'National Housing Standard' and a 'National Home Building Manual'.

Performance-based building code

The building regulatory reforms of the early 1990s, culminating in the single national BCA, were always directed at the ultimate goal of introducing a nationally consistent performance-based building code. This was supported by the findings and recommendations of the BRRT report in 1991. The 1996 release of the BCA (BCA96) was the first performance-based building code in Australia.

The objectives behind a performance-based building code have been well established internationally: by focussing on the outcomes that the building is required to deliver, it is expected that the market will have more flexibility to develop innovative and cost effective solutions. The ultimate goal is to improve the efficiency of the market in delivering no less than a minimum level of building quality, without being overly prescriptive and impeding the uptake of new technologies and design principles.

The ideology behind a performance-based code is that it focusses on the following attributes (IRCC, 2010):

- minimum requirements, not aspirational goals;
- objective outcomes, not subjective methods; and,
- final product delivery, not process of delivery.

Beyond the construction of the building, performance-based regulations have also been considered useful in reducing ambiguity in product requirements across interstate and international market borders. Where prescriptive, process oriented regulations may generate confusion, performance requirements are thought to provide clearer means of assessing suitability and eligibility of traded goods in different markets. The expected result is a greater use of internationally developed products within domestic markets. Where the international trade argument may not be strong in Australia, there is a parallel to improving interstate trade where product developers and designers are able

to access a single national market instead of eight individual State and Territory markets.

Technological change and innovation are by definition difficult to predict. Therefore, by focussing the regulations on the outcomes or the performance of a building, and stepping back from the process of construction, it is expected that the market can more readily take advantage of technology changes that were not envisaged when the regulations were drafted.

Various studies have identified the expected benefits and some of the potential costs associated with performance-based standards. Identified benefits include:

- cost savings relating to efficiency of design and construction;
- more functional and aesthetic buildings;
- the flexibility to use new building products and materials, which encourages innovation by product manufacturers; and
- more regular updating of the Deemed-to-Satisfy (DTS) provisions (KPMG, 2000) or alternatively less updating as DTS becomes only one means of compliance.

Some of the potential costs associated with use of performance-based solutions include (PC, 2004):

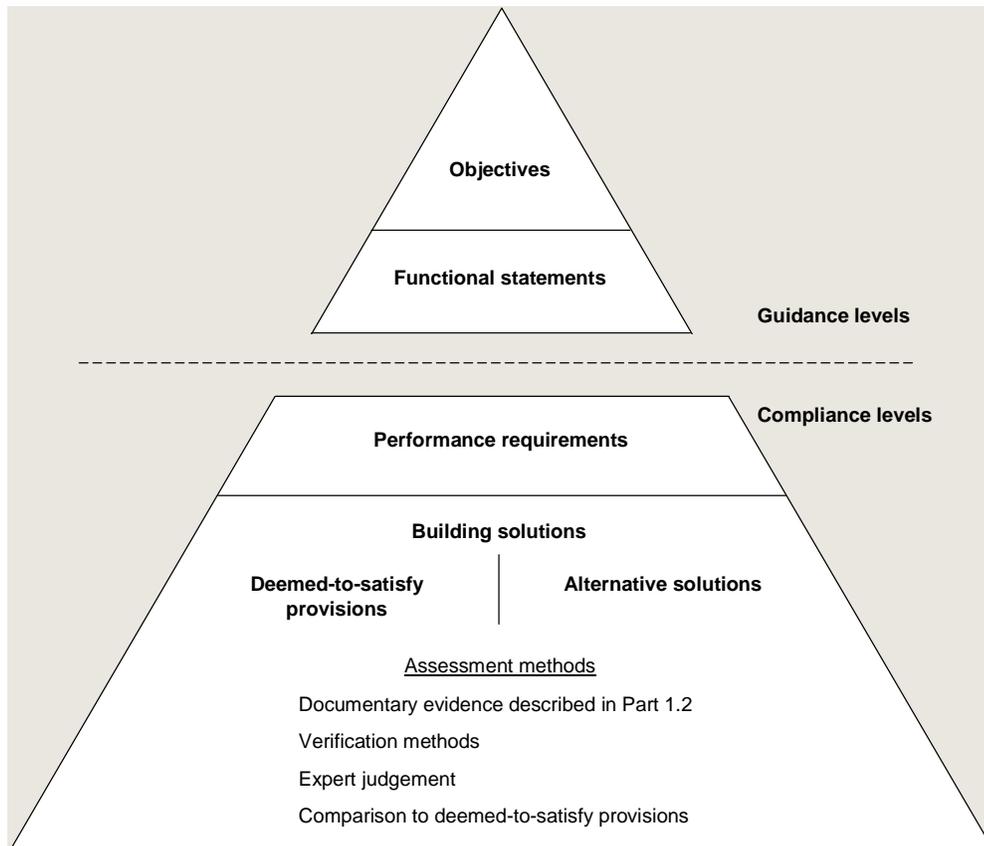
- increased costs of building surveying, engineering and design associated with performance-based solutions;
- increased difficulties in assessing compliance with performance-based regulation;
- increased lifecycle costs, including:
 - a tendency for performance-based design solutions to shift the financial burden from the construction phase to the owner in the maintenance phase, from passive systems to active systems;
 - performance-based design solutions may increase the level of energy and water consumption by building occupants; and
 - decisions made at the design phase to meet performance requirements may specify or restrict how space in the building can be used.

Model of performance-based regulation in Australia

The performance-based BCA was developed around a hierarchy of requirements for buildings, drawing heavily on the hierarchy that was published by the Nordic Committee on Building Regulation in the late 1970s (IRCC, 2010).

Chart 2.2 provides an illustration of the BCA hierarchy and compliance pathways. The highest level of the hierarchy is the Objectives of the BCA — broad, community goals for building regulations such as protecting life safety.

2.2 The BCA hierarchy



Source: Figure 1.0.3 of BCA Volume Two, Guidance on compliance with the BCA.

Functional Statements, referencing the issues that must be addressed to ensure that the Objectives mentioned above are achieved, follow this; an example is that ceiling heights or room space must be suitable for the intended use of the room.

The third level of the hierarchy is the legally binding Performance Requirements, which state the required performance of the element or design through which objectives may be achieved. These Performance Requirements mandate for example, requirements on the strength and durability of construction materials, desired outcomes for energy efficiency requirements as well as the generation and maintenance of safe and habitable living environments for residents (ABCB, n.d. [BCA — Building Code of Australia, Information from the Australian Building Codes Board]).

To achieve compliance with the BCA Performance Requirements, two alternative methods may be used. Firstly, Deemed-to-Satisfy (DTS) provisions are included in the BCA, identifying construction practices and references to Australian Standards that, when followed and adhered to, are considered sufficient to achieve the required Performance Requirements. The second option is the corner stone of performance-based building regulation, the ability to propose an Alternative Solution able to meet the Performance Requirements.

It is also the combination of these two options, and the ability to utilise them across different elements of the building that provide flexibility within the Australian construction industry to ensure that both safe and enduring buildings are constructed and that innovation in design and construction is facilitated.

State and Territory supports for performance-based BCA

Where building and construction regulations are the responsibility of the State and Territory governments in Australia, the BCA is given status to cover technical aspects of building construction through individual State and Territory enacting legislation. As well as giving status to the BCA, these State and Territory pieces of legislation generally cover a range of issues involving the construction and building industry including:

- issuance of building permits;
- inspections both during and after construction;
- issuance of occupancy or compliance certificates; and,
- accreditation or approval of materials or components.

These supporting institutions are known to be very important to the operation of performance-based building regulations and many of these issues were included in the development of the National Model Building Act, published in 1991. Examples of recommendations underlying the National Model Building Act include:

- liability laws: for example a ten year liability cap on the initiation of legal proceedings for problematic building work and proportionate liability be introduced such that no defendant can be held liable for more than their contribution of responsibility;
- insurance laws: with the removal of joint and several liability, it was advocated that all key building practitioners therefore be required to be insured to protect owners should they need to seek compensation;
- private certification regimes: where the local building approval system was set up as a monopoly (through local government, for example) the result was a slow and costly process;
- clear compliance and probity regulations;
- registration systems: required for key building practitioner players of builders, engineers, building surveyors, building inspectors and architects.

While the Model Building Act was not adopted as a whole, over the following ten years, some States and Territories did introduce key elements to varying degrees including (Lovegrove, 2010):

- proportionate liability and a ten year liability limitation period;
- private certification of building approvals;
- an expedited building approval dispute resolution system; and
- compulsory registration and insurance of building practitioners.

National construction code

The most recent major building regulation reform is the development of the National Construction Code (NCC). The first edition was published in May 2011, expanding on the BCA's previous two-volume structure and incorporating the Plumbing Code of Australia (PCA) as Volume Three.

The PCA was developed by the National Plumbing Regulators Forum (NPRF), a committee of Australian technical and occupational plumbing regulators, and published in 2004 as a performance-based document consistent with the BCA format. The objective of the PCA was to increase consistency of plumbing requirements across Australia. However, there were notable limitations to this consistency, with table 2.3 outlining the scope of adoption of the PCA across the States and Territories.

The objective of the NCC was to elevate the position of plumbing elements of building and construction into a single encompassing construction code with a single review and administration system at the national level. While the implementation model chosen was the insertion of the PCA in its entirety in to the NCC, future annual reviews are to be focussed on working to address issues of consistency and overlap between the volumes and to promote wider national adoption of the PCA.

2.3 Adoption of the PCA by State and Territory plumbing regulators

Jurisdiction	Extent of adoption of the PCA
Australian Capital Territory	Parts A, B, C and G
Queensland	Parts A, B, C and G. The Queensland Plumbing and Wastewater Code prevailed over the PCA in cases of inconsistency
South Australia	Parts A, B, C, F2 and G
Tasmania	The Tasmanian Plumbing Code referenced and varies the PCA
Victoria	Parts A, B, C, D (with restrictions), E and G
New South Wales	Nil – the New South Wales Code of Practice for Plumbing and Draining adopted 'AS3500:2003 and amendments and Part 5 2000
Northern Territory	Nil – The Building Regulations call up AS3500
Western Australia	Nil – State regulations call up AS3500:2003 Parts 1, 2 and 4

Note: This table outlines the use of the PCA by plumbing regulators for regulation of plumbing practices and may be wider than installation requirements. The PCA may be further referenced by health regulators when regulating on-site waste water management. Source: ACG (2009) Regulation Impact Statement for a National Construction Code: Decision RIS.

The concept of expanding the BCA to include building trades such as plumbing, electrical and telecommunications has been discussed for a number of years.

There were two major building regulation reports published in 2000, both of which referenced the issue of plumbing interactions with the BCA. The Fisher Stewart Report for DISR in 2000 considered the plumbing industry in particular and noted a number of disparities in plumbing regulations across the States and Territories, but there was no quantitative analysis completed, nor any recommendations made. The Laver Review of the ABCB considered in more detail the national regulation of plumbing in Australia. Recommendations were made for the establishment of a nationally consistent plumbing

code, but the report also found that there were limited cost efficiencies to be achieved from including plumbing with the BCA. Further, plumbing was considered a lower priority for government review than energy efficiency and disability access.

In 2002, in response to recommendations for national reform of plumbing industry regulation, the NPRF was established, convened by the Victorian Plumbing Commissioner. The first agenda item for the Forum was the development and publication of the PCA. First published in 2004, the PCA was designed as a performance-based stand-alone document that was considered compatible with the BCA. It was adopted by the Australian Capital Territory, Queensland, South Australia, Tasmania and Victoria. New South Wales, Western Australia and the Northern Territory did not adopt the PCA.

Behind the PCA, it is important to note that all States and Territories required compliance with a single technical standard for plumbing work — Australian Standard 3500. That is, all jurisdictions had extensive consistency in technical, deemed to satisfy plumbing installation requirements.

In the same year, 2004, the Productivity Commission published a wide-ranging review of building regulation reform. In this report, the Commission acknowledged the work of the NPRF and the role of the PCA to achieve national consistency in plumbing regulations. One conclusion of the report was that while there were no major conflicts between the PCA and BCA there was limited evidence that net benefits could be achieved from integration.

From 2004 onwards however, there was a noticeable shift in the emphasis of government policy towards energy efficiency, environmental outcomes and sustainability. This shift was felt strongly in the building regulations, as has been noted with respect to the development of specific energy efficiency provision in the BCA.

The first concrete steps towards a NCC were made following a 2007 report of the House of Representatives Standing Committee on Environment and Heritage. The committee recommended that COAG explore 'options for constituting a national coordinating body that can take responsibility for improving the coordination and cohesion of regulatory arrangements for controlling plumbing product quality in Australia, including mandatory schemes, relevant standards and their application across jurisdictions'. COAG agreed to the development of a NCC to incorporate building, plumbing, electrical, telecommunications and asked the Business Regulation and Competition Working Group (BRCWG) to report on implementation options.

The report outlining the Business Case for a National Construction Code, released in 2008 (ACG, 2008), found that due to the increased policy focus on sustainability in the built environment, there were now possible net benefits to be reaped from integrating the PCA with the BCA. However, these findings were limited to integration of plumbing and building, and not the other trades.

The RIS process was finalised the following year when the 2009 Decision RIS outlined the following expected benefits from a NCC including plumbing:

- efficiency gains to governments through consolidation of administration for building and plumbing;

- reduced costs to firms operating at a national level (through more consistent regulation);
- efficiency gains on-site in operating from one code; and
- economies of scale in building products.

The quantitative analysis of the Decision RIS was quite limited, noting the significant difficulties faced in quantifying the benefits of integrating the PCA and publishing the NCC. However, the break-even analysis used reported low expected transition costs, and inferred a high probability that national benefits would outweigh these transition costs to industry and regulators.

The most recent review of the NCC is a 2012 report published by the Productivity Commission reviewing the Council of Australian Governments' initiatives promoting regulatory consistency across jurisdictions (of which the NCC was one). The report went one step further than the Decision RIS published in 2009, to estimate substantial net benefits accruing to the Australian economy from the NCC. These figures were noted to be exploratory and were not able to be verified through observed changes in industry growth patterns or productivity measures due to the short period of time the NCC had been in place.

Table 2.4 provides an outline of the progression of findings on the NCC and plumbing regulation reforms since 2000.

2.4 Progression of assessments of a joint building and plumbing code

Report	Finding
Fisher Stewart Report (2000) 'Australian on-site plumbing regulatory framework'	Noted disparities in State and Territory requirements but provided no analysis or recommendations, only highlighting areas of possible benefits from rationalisation.
Laver Review (2000) ABCB mid-term review	The report recommended the development of a national plumbing code but found limited cost efficiencies from inclusion in the BCA. At the time, plumbing issues were considered to be a lower priority to energy efficiency considerations and disability access.
Productivity Commission (2004) Building Regulation Reform	The report acknowledged the role of the Plumbing Code of Australia in seeking national consistency but found that so long as the PCA and the BCA were not in conflict that there was limited evidence that integration would be warranted.
Allens (2008) Business Case for a National Construction Code	The report found that since the PC 2004 report, the increasing policy focus on sustainability and drought based water restrictions had resulted in efficiency gains being anticipated from integrating the PCA and the BCA.
Allens (2009) Decision RIS on the development of the NCC	Main benefits from the NCC were considered to be a reduction in duplication of the Plumbing Code of Australia and the Building Code of Australia, as well as clarification around accessibility requirements. Transition cost to government and industry were quantified, economy wide benefits were not quantified.
Productivity Commission (2012) COAG reform agenda	Based on the Allens (2009) Decision RIS, the Productivity Commission published estimates of the net benefits of including plumbing in the BCA.

Source: Compiled by TheCIE.

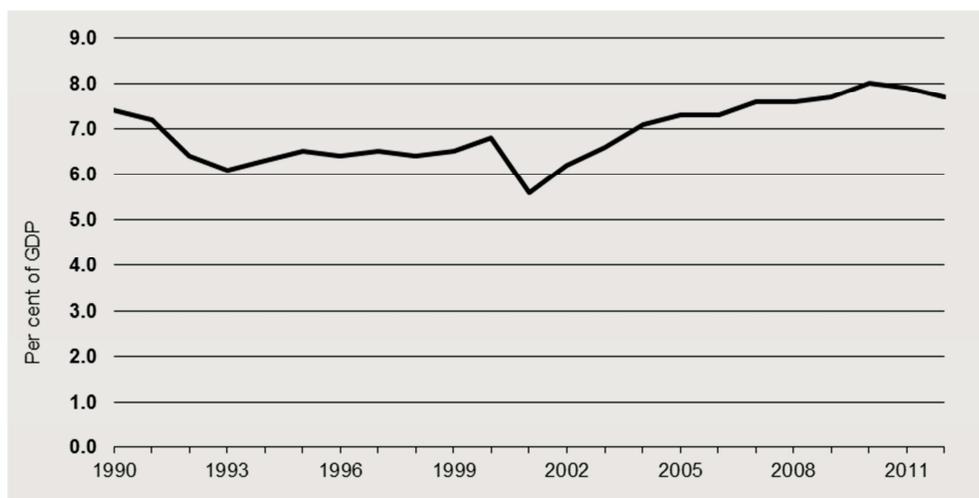
3 *Building industry performance: what's at stake?*

The two factors determining the magnitude of any building regulation reform benefits are i) the size and time dimension of the productivity 'shock' delivered by the reforms and ii) the size of the industry (or segment of the industry) to which the shock applies. It is therefore useful to review the available data relating to the building industry to determine the wider context for reform and possible scale of expected benefits.

Dimensions of the building industry

The construction industry is a significant contributor to the Australian economy. The Australian Bureau of Statistics (ABS) reports that in 2011–12, the gross value added of the construction industry was around \$106.5 billion, or around 7.7 per cent of total gross value added at basic prices. Over recent decades, the construction industry has typically made up around 6-8 per cent of the Australian economy (chart 3.1).

3.1 Construction as a share of total gross value added at basic prices



Data source: ABS Catalogue No. 5204.0, System of National Accounts.

However, this definition of the construction industry is broader than the scope of the NCC and former BCA. While 'buildings' are a significant component, the construction industry as defined under the Australian and New Zealand Standard Industrial Classifications (ANZSIC) also includes engineering construction, such as roads, bridges, mines etc. These activities are not covered by the NCC.

To focus on the scope of NCC coverage, the ABS does provide further disaggregation on the construction industry in certain publications. For example, *Australian Industry*

(Catalogue No. 8155.0) provides estimates on Industry Value Added disaggregated by building construction, heavy and civil engineering construction and construction services (ANZSIC subdivision level). Based on these estimates, the value-added of the building construction industry was around \$21.5 billion in 2010–11, or around one quarter of total construction (table 3.2). However, the ‘construction services’ industry covers a wide range of activities that are involved in constructing a building, most importantly plumbing, but also site preparation services, concreting services, bricklaying services, roofing services, structural steel erection services, as well as activities associated with building completion, such as tiling and carpeting services, painting and decorating services and glazing services. Importantly, many (not all) of these activities are also covered by the NCC and need to be included in any analysis.

3.2 Industry Value Added

	Building Construction	Heavy and Civil Engineering Construction	Construction Services	Total Construction
	\$ million	\$ million	\$ million	\$ million
2006–07	15 593	9 062	50 808	75 463
2007–08	15 833	12 694	46 727	75 255
2008–09	18 007	14 627	46 265	78 899
2009–10	19 145	16 085	48 730	83 959
2010–11	21 489	13 616	53 411	88 516

Note: The sum of the industry value added components of the construction industry in ABS cat 8155.0 is significantly less than the gross value added measure reported in the National Accounts (ABS cat 5204.0). The ABS notes that differences between the estimates given in the Australian Industry publication and those from other sources may arise due to sampling or non-sampling error, or from differences in scope, coverage, definitions or methodology

Source: Australian Bureau of Statistics, Australian Industry, Catalogue No. 8155.0.

Another measure of the size of the building industry is the value of work done. In contrast to the measures reported above, which are value added measures (the value of outputs less intermediate inputs), this is a measure of the value of output. In 2011–12, the value of building work done was around \$80 billion, with residential building work done valued at around \$46.0 billion and non-residential building work done valued at around \$33.2 billion (table 3.3). Building construction was around 40 per cent of total construction. These figures suggest that the residential and commercial construction sectors to which the NCC applies have annual output of around \$80 billion a year.

3.3 Value of construction work done

	Value of construction work done in 2011/12	Share of total construction work done
	\$ billion	Per cent
Residential construction	46.0	23.3
Non-residential construction	33.2	16.8
Engineering construction	118.4	59.9
Total	197.7	100.0

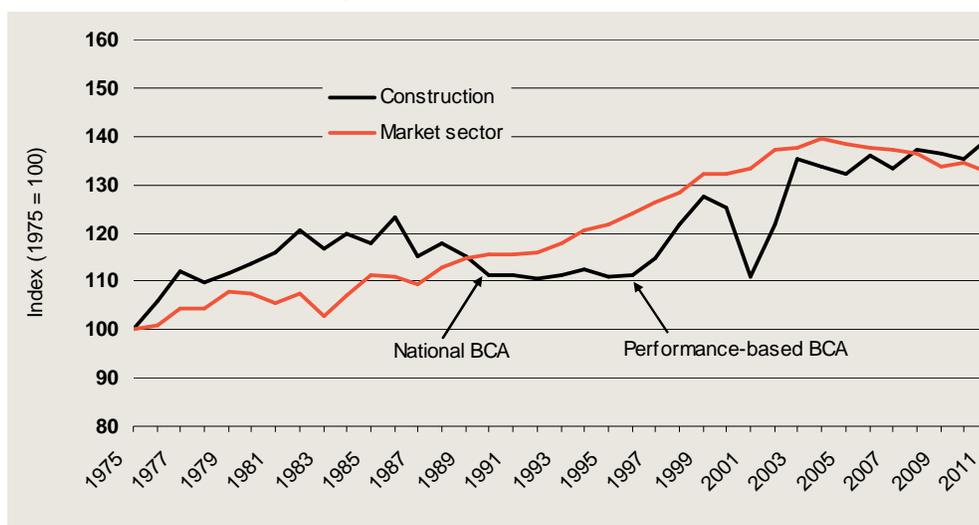
Source: Australian Bureau of Statistics, *Building Activity*, Catalogue No. 8752.0; Australian Bureau of Statistics, *Engineering Construction Activity*, Catalogue No. 8762.0; TheCIE.

Productivity performance

Microeconomic reforms would generally be expected to improve industry productivity over time. While it is not possible to attribute any productivity trends observed over the reform period directly to the reforms, it nevertheless provides some useful context for a more detailed examination of the impacts of the reforms to the building code.

Unfortunately, industry productivity estimates are published for the construction industry in total (ANZSIC 1-digit level), which includes engineering construction. Chart 3.4 shows multi-factor productivity in the construction industry, compared to the market sector over time. The implementation of the national BCA and the performance-based BCA are shown.

3.4 Multi-factor productivity



Data source: ABS, Productivity Commission.

Key observations are:

- In the period immediately following the adoption of the national BCA by States and Territories in around 1993, multi-factor productivity (MFP) in the construction industry stayed relatively constant. The performance of the construction industry during this period was in contrast to the market sector, where MFP grew relatively strongly. This continued a trend of productivity performance in the construction industry lagging the broader economy.
- By contrast, MFP grew strongly in the period following the adoption of the performance-based BCA in the 1997 to 1998 period. In the period between 1995–96 and 2002–03, MFP in the construction industry grew at an average annual rate of 2.8 per cent, despite a sharp decline in MFP following the introduction of the GST (table 3.5). Total growth in MFP during this period was around 21.5 per cent. Productivity growth in the construction industry outpaced the broader economy during this period and there were likely a number of contributing factors.
- Since the NCC was implemented only recently, it is too early to observe the industry productivity performance.

3.5 Average annual growth in multi-factor productivity

	Construction industry	Market sector
	Per cent	Per cent
1981-82 - 1989-90	-1.0	0.9
1989-90 - 1995-96	0.0	1.2
1995-96 - 2002-03	2.8	1.5
2002-03 - 2010-11	0.4	-0.4

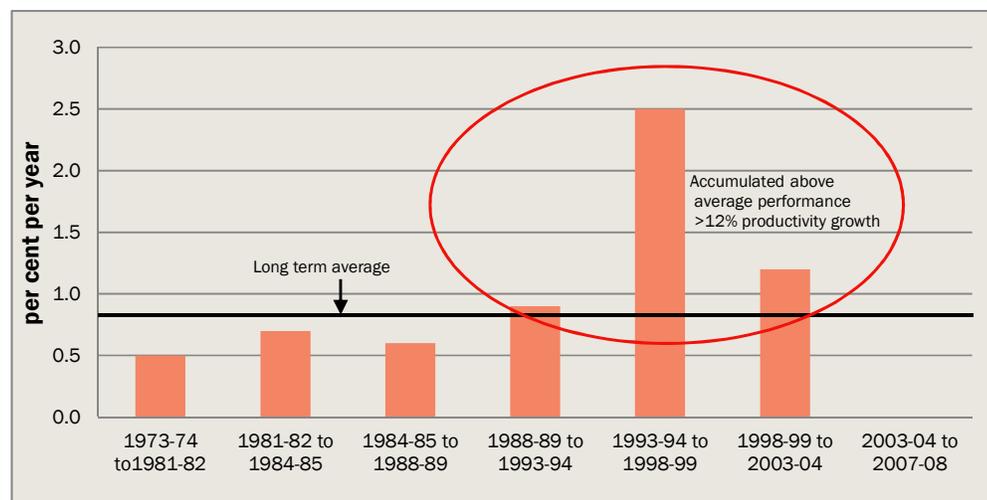
Source: ABS, Productivity Commission.

TheCIE model: the potential value of regulatory reform

According to the Productivity Commission (Banks 2002 and Parham, 2012), microeconomic reform delivered a surge in economywide total factor productivity gains in the 1990s (chart 3.6).

- Although it is difficult to be precise, Australia's surge above the long-term average productivity growth rate would accumulate to over 12 per cent during this period.
- Microeconomic reforms included exchange rate and capital market reforms, trade reform, competition policy and infrastructure reform, labour market reform, government services reform, taxation reform and regulatory reform.
- Given regulatory reform is but one part of the full microeconomic reform picture, only part of the 12 per cent improvement can be attributed to it. On this basis, it might be reasonable to attribute 1 or 2 percentage points of the 12 per cent gains to regulatory reform.

3.6 Above average gains attributed to microeconomic reform



Data source: ABS, Productivity Commission.

The aggregate effects of wider microeconomic reform help to provide some indication of the scale of gains that might be expected from regulatory reform across the economy.

That said, not all sectors would be affected equally, some sectors contributed more than others to overall growth and construction was a strong contributor (Parham, 2012).

TheCIE's model of the Australian construction sector can be used to assess the net economic benefits to the economy of productivity improvements in that sector. The value of output of the residential and commercial sectors is around \$80 billion a year in the model (which is the same as that deduced from table 3.3). Table 3.7 set outs how changes in construction sector productivity affect the sector itself and the wider economy. For instance, a one per cent increase in multi-factor productivity in residential building causes a 0.357 per cent increase in output of housing and a 0.092 per cent increase in gross domestic product. That the increase in housing output is less than one per cent indicates that the housing sector passes on much of its productivity improvement to other parts of the economy.

- A one per cent increase in productivity means, all other things equal, the building sector can either produce one per cent more output per unit of input or it can produce the same amount of output using one per cent fewer inputs.
- As a result of productivity changes, prices and costs change according to demand and supply conditions across the economy. It is these changes and conditions that ultimately determine how much the building sector expands as a result of productivity change.

3.7 Effects of a 1 per cent productivity boost in building: CIE model results

	Cost share	GDP	Sectoral output	Household consumption	
	%	%	%	%	\$ million
Residential building					
Total factor productivity	100.00	0.092	0.357	0.051	404.84
Labour productivity	11.14	0.014	0.046	0.008	61.01
Capital productivity	10.96	0.005	0.031	0.001	5.06
<i>Intermediate input productivity</i>					
- Construction services	28.11	0.026	0.102	0.013	107.14
- Business services	8.46	0.009	0.031	0.004	35.70
- Non-metal prods and concrete	6.60	0.007	0.029	0.004	32.36
- Metal products	6.00	0.007	0.026	0.004	35.30
- Financial services	4.39	0.004	0.016	0.002	16.05
Commercial building construction					
Total factor productivity	100.00	0.051	0.089	0.025	202.53
Labour productivity	15.05	0.009	0.017	0.005	38.16
Capital productivity	18.80	0.007	0.014	0.002	12.57
<i>Intermediate input productivity</i>					
- Construction services	19.27	0.010	0.017	0.005	38.52
- Business services	9.98	0.006	0.009	0.003	21.49
- Metal products	3.57	0.002	0.004	0.001	10.34
- Tech services	3.43	0.002	0.003	0.001	9.33
- Non-metal prods and concrete	3.16	0.002	0.003	0.001	7.82

Source: CIE-REGIONS model simulation. Residential building refers only to stand alone housing (Volume Two construction projects)

As observed by a less than one per cent increase in sectoral output, the housing tends to pass on its productivity increases to the rest of the economy in the form of freeing up resources for other sectors where demand for those resources is highest. This holds across the entire construction sector: where the same output can be produced with fewer inputs, those released inputs tend to allow for expansion of mining and manufacturing in the Australian context, for instance.

Productivity improvements in any one sector translate into flow-on benefits to other sectors and ultimately these benefits translate into increased incomes, lower prices or better quality products — in effect, increasing the spending power of households. In an economywide model, increases in household consumption are measured as a net benefit. By accounting for all flow on effects, an economywide model provides a comprehensive accounting of the net economic benefits arising from reform.

In table 3.7 it can be seen that a one per cent increase in productivity in the residential sector results in a \$405 million dollar a year net benefit or increase in household consumption. If commercial building is included, the net benefit or increased household consumptions from a one per cent total factor productivity increase across the entire construction sector is \$607 million dollars in 2012 terms. Various components of that productivity change are also reported broken down by labour, capital and other inputs.

Key points

- **The building industry is large, with the value of building work done around \$80 billion in 2011–12. This means that even small productivity improvements resulting from the reforms would deliver large benefits in dollar terms.**
- **The timing of the introduction of the nationally consistent BCA coincided with a time of broadly flat productivity growth in the construction industry, which was not reflected in the broader economy.**
- **In the period following the introduction of the performance-based BCA, productivity increased by around 21 per cent in total at an average rate of around 2.8 per cent per year. This was a significantly faster pace than the broader economy and likely due to a number of contributing factors.**
- **Indicators of the productivity improvements from all microeconomic reform across the Australian economy point to gains from building regulatory reform of 1 to 2 per cent.**
- **TheCIE model results suggest that a one per cent increase in productivity in the construction sector due to regulatory reform (were it achieved) would deliver net benefits of \$600 million a year in 2012 dollar terms.**

4 *Expected benefits from reforms*

In this chapter, we review the benefits that the three reforms were expected to deliver, both at the time they were implemented and in subsequent reviews. We review the expected benefits in both qualitative and quantitative terms.

Single national construction code

The anticipated benefits of a nationally consistent BCA were articulated in the Final Report of the Building Regulation Reform Taskforce. This report was published in 1991 following the development of the first nationally consistent BCA in 1990, but before it had been adopted by State and Territory Governments. The BRRT saw uniform national standards as essential to achieve (BRRT, 1991):

- Scale — a national approach was expected to create a single domestic market for the building and construction industry;
- Innovation — greater flexibility in technical regulation was considered essential to enable increased innovation in building and construction. The BRRT considered that the development and operation of a more flexible ‘performance-based’ regulatory approach required effective national coordination of existing Australian systems and research infrastructure;
- Efficiency — a consistent set of regulations and procedures was expected to, over time, lead to greater consistency in interpretation at the local level. This was expected to provide considerable efficiency gains in terms of reduced delays, variations and appeals.
- Transferability — a uniform national approach to qualifications of building industry professionals was considered important so that the best expertise can be applied to major building projects.

However, the National Building Regulatory Framework envisaged by the BRRT extended beyond just the BCA (see box 4.1). This implies that all of the benefits outlined above cannot necessarily be achieved by a nationally consistent building code alone.

A more recent study by the Productivity Commission outlined the benefits of a nationally consistent building code specifically. These benefits included:

- Reduced costs for builders and designers working across state borders — these firms do not have to expend resources understanding and complying with multiple building codes. A nationally consistent BCA may also encourage building practitioners to operate in a number of jurisdictions, promoting economies of scale and more efficient building practices.

4.1 National Building Regulatory Framework envisaged by the Building Regulation Reform Taskforce

In addition to the BCA, the main elements of the National Framework envisaged by the BRRT included:

- Consistent legislative principles — the BRRT considered consistency in State and Territory enabling legislation to be highly desirable in promoting national uniformity in building regulation. The BRRT considered that such consistency could best be achieved through the use of an agreed set of legislative guidelines.
 - Model Administrative Code — the BRRT proposed establishing a Model Administrative Code with consistent guidelines relevant to the application, assessment, decision, compliance and dispute resolution for building design, construction and occupancy.
 - Suite of National Building Standards — the BRRT argued that a comprehensive suite of up-to-date building standards is required to meet both the needs of the building regulations and the contractual and commercial requirements of industry.
 - The BRRT also envisaged national fora to help co-ordinate the National Framework, including:
 - Australian Building Regulation Corporation — a critical element of the BRRT’s proposed framework was a joint government-industry organisation to develop and maintain the Framework on behalf of all levels of Government, industry and the Australian community; and
 - Annual Building Ministers’ Conference — Relevant Federal, State and Territory Ministers to meet annually to review progress in developing and maintaining the National Framework and to set the national building regulation policy agenda and ensure continued high level support for the reform process.
-
- Better compliance with building regulations — a single nationally consistent BCA reduces misunderstanding of and confusion between codes;
 - Creation of a larger market for building products — suppliers of building products are able to manufacture the same product in each State and Territory, rather than having to manufacture different products to meet each different code. This promotes cost savings through increased economies of scale in production and through increased competition between manufacturers.
 - Transferability of building designs — the same design can be used in different jurisdictions, rather than having to alter designs to meet different requirements in each jurisdiction.
 - Transferability of skills — skills should be able to be transferred more easily, with attendant benefits in terms of allocation of resources and reduced retraining costs in the industry.
 - Savings in code development costs — since only one code has to be developed, there should be savings in code development costs, notwithstanding additional initial

development costs, given the national code has to deal with a wider variety of buildings and environments and the resources needed to achieve consensus across jurisdictions (PC, 2004).

Evidence that the benefits are being realised

It is important to note that the national regulatory framework envisaged by the BRRT has not been fully realised. Key elements of the framework have not been fully implemented. For example, only some elements of the Model Building Act and Model Administrative Code were implemented by States and Territories.

Nevertheless, the Productivity Commission noted that the BCA was a substantial step towards national consistency, citing the substantial reduction in state-based variations as evidence (PC, 2004). However, some participants in the Commission's study noted that there was still a significant lack of consistency between State and Territories in some areas. Local Government planning controls and other regulations that affect building regulation and the administration of the BCA were identified as key sources of inconsistency (PC, 2004).

Estimated benefits

There are a number of studies that estimate the benefits of an improved regulatory framework for the building industry. In general, these studies estimate that regulatory reform in the building industry could deliver significant benefits to the community. However, no studies that we are aware of estimate the benefits of a nationally consistent building code specifically.

The BRRT estimated that achievement of building regulation reform would yield real tangible national benefits of at least \$250 million per year. This estimate was based on consideration of the estimates in expert studies in relation to the main components of the proposed reform strategy (table 4.2). The BRRT considered there was an element of double-counting in adding up the benefits of each reform from each separate study. The \$250 million estimate was considered an achievable lower bound.

4.2 Annual benefits estimated by the Building Regulation Reform Taskforce

Reforms	\$ million
Reform of fire regulations based on appropriate risk assessment methodology	200
Performance-based national BCA	200
Reform of the suite of Australian building standards	75
Reduced delays/variations/disputations following planning approval	250

Source: Building Regulation Review Taskforce, 1991, *Microeconomic Reform Building Regulation*, Final Report, November, p. 21.

It is important to note that the BRRT's estimate relates to the full suite of reforms outlined above. Given that many elements of the reform package have not been achieved, it would be reasonable to infer that BRRT would have expected the benefits of

a nationally consistent BCA in itself would be significantly lower than \$250 million per year. Of the reforms quantified in table 4.2, the only item directly related to the nationally consistent BCA is the reform of building standards. The development of the nationally consistent BCA appears to have been associated with a general updating of building standards. The remaining items are more relevant to the performance-based BCA (see below) and the way the regulatory system is administered.

An Industry Commission report in 1995 estimated that reform to building regulation could deliver significant benefits to the community. The Commission judged that a conservative indication of the potential gains from more cost-effective building regulations would be around \$350 million per year, equivalent to some 1.5 per cent of building activity (residential and non-residential) valued at around \$25 billion each year. This was based on reduced costs of \$100 million, or 0.8 per cent in residential building construction and \$250 million or 2 per cent of non-residential building construction (Industry Commission, 1995). However, the report did not specify what the reforms were. Given that the Industry Commission's report was published after the nationally consistent BCA had already been implemented, this is unlikely to have been the reform that the Commission had in mind.

The Industry Commission also estimated that unnecessary delays in building approvals impose a significant cost to the community. It estimated that around \$750 million per year, or 3 per cent of the cost of building activity might be saved if unnecessary delays due to regulation could be eliminated. These estimates were based on a study by the University of Tasmania that suggested that delays may add 5–10 per cent to the cost of development projects and that around one third of these delays may be attributable to regulatory delays (Industry Commission, 1995). However, a nationally consistent BCA does not necessarily help to reduce delays.

The Allen Consulting Group (ACG) estimated the National Administration Framework for the building industry could deliver benefits of between \$214 million and \$402 million per year. To arrive at this estimate, ACG subtracted the benefits of performance-based standards and private certification from an overall estimate of the benefits of building reform (ACG, 2002 p. ix).

- The overall benefits of building reform were estimated at between \$1.4 and \$1.6 billion, based on the Industry Commission's overall estimate of the potential benefits of building reform of \$1.1 billion, inflated to 2002 dollars.
- The benefits attributed to performance-based standards were estimated at \$646 million, estimated by extrapolating the estimates provided by CSIRO (1999) for Victoria across the whole country.
- The benefits of private certification were estimated at \$523 million.

This is summarised in table 4.3.

While none of the above benefits relate specifically to the BCA, it is necessary to have a nationally consistent BCA in order to realise any of the benefits of a National Administration Framework and performance-based standards.

4.3 Estimated benefits of building reform

	Lower bound	Upper bound
	\$ million	\$ million
Total benefits of building reform	1 383	1 571
Less:		
Benefits of performance-based standards	646	646
Benefits of private certification	523	523
Equals		
Unrealised benefits of National Administration Framework	214	402

Source: ACG, 2002, *Harmonisation of Building Control Administration*, Final Report for the Australian Building Codes Board, p. 34.

Performance based code

As outlined above, the BRRT expected a performance-based BCA would encourage innovation by allowing greater flexibility (BRRT, 1991). A number of subsequent post-implementation studies have elaborated on the costs and benefits of using performance-based solutions (see table 4.4). The identified benefits of using performance-based solutions can be summarised as:

- cost savings from more efficient design and construction;
- more functional/aesthetic buildings; and
- new building products and materials.

Studies have also highlighted some potential costs associated with the use of performance-based standards, including:

- increased difficulty in assessing compliance;
- higher lifecycle costs, including higher maintenance costs, lower safety standards and higher energy and water consumption.

Evidence benefits have been realised

There is a range of evidence presented in the literature that shows that at least some of the intended benefits of the performance-based BCA have been realised. This body of evidence includes:

- surveys;
- case studies; and
- other evidence, such as interviews with stakeholders etc.

Survey evidence

For the performance-based BCA to deliver net benefits to the community, it is essential that performance-based solutions are being used and there are benefits from the use of those solutions. Surveys have tended to find that while performance-based solutions generally deliver net benefits and that performance-based solutions are being used, albeit on a relatively limited scale.

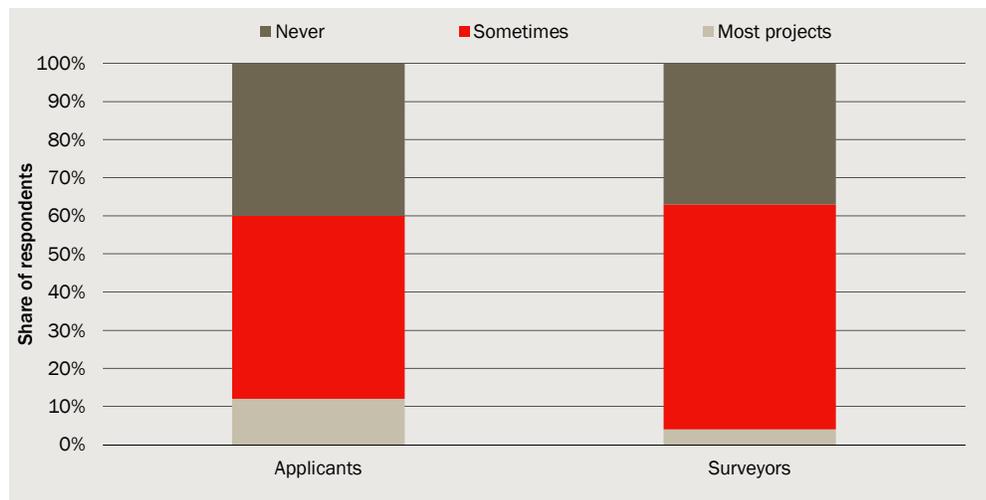
4.4 Benefits and costs of using performance-based solutions

Study	Benefits	Costs/challenges
CSIRO (1999)	<ul style="list-style-type: none"> ▪ Time savings — use of performance based solutions can result in significant time savings, particularly on commercial buildings. ▪ Cost savings — use of performance-based design options can reduce the project cost. ▪ Savings in effort — mainly related to eliminating the need to prepare submissions to the appeals board. ▪ Intangible benefits — the flexibility under the performance-based BCA has allowed designers and builders to be much more innovative in their solutions to problems. 	
KPMG (2000)	<ul style="list-style-type: none"> ▪ Costs savings related to efficiency of design and construction — where identified these range from one to five per cent of the total construction cost. In some instances, this magnitude of savings was a make or break difference to the economic viability of this project. ▪ Being able to adopt designs that were better able to meet the functional, financial and aesthetic requirements of end users and owners. Operators were able to achieve economies by generating more lettable space. ▪ The flexibility to accommodate new buildings products and materials. ▪ The performance-based BCA accommodates the constant and accelerating evolution of more sophisticated materials and technologies which are even more difficult to regulate using one size fits all standards. ▪ Improved levels of 'life safety', particularly through adoption of situation specific modelling. 	<ul style="list-style-type: none"> ▪ Increased costs of building survey, engineering and design as these parties invest more time exploring creative design solutions. ▪ A tendency for performance-based design solutions to shift the financial burden from the builder in the construction phase to the owner in the maintenance phase. ▪ Value engineering is pushing design to the edge of the envelope, with scope for abuse. ▪ Inevitably, design innovation around each item in the code uncovers valuable insights and advances from time to time, which should be captured and reflected in future editions of the code.
Productivity Commission (2004)	<ul style="list-style-type: none"> ▪ Flexibility — by allowing builders and designers to use any solution that complies with the performance-based requirements, the BCA offers more flexibility than is embodied in the prescriptive regulation. ▪ Innovation — rather than being constrained to a single prescriptive solution to comply with regulation, practitioners are at liberty to innovate and use any solution that meets the performance requirements. ▪ Cost savings — by allowing choice over which building solution can be used (and still meet regulations), practitioners can choose the cheapest option, thereby reducing the cost of the building. In addition, by allowing the choice of building solution, practitioners can make use of the cheapest solution in any instance, rather than being limited to single prescriptive solution that may be cost effective in some situations but not in all. By allowing the use of innovative solutions, the latest technology, performance-based regulations mitigate the need for innovative solutions to be approved and written into prescriptive regulation before being used. 	<ul style="list-style-type: none"> ▪ Difficulties in assessing compliance with performance-based regulation — assessing compliance with performance-based regulation is more demanding and costly than for prescriptive regulations. ▪ Increased lifecycle costs — the greater flexibility in the design of buildings afforded by performance-based regulation, allows various trade-offs between construction and use costs, including: <ul style="list-style-type: none"> – higher maintenance costs; – lower safety standards; – higher consumption of water and energy; or – restrictions on the way the building can be used or occupied.

Source: S.N. Tucker, P.G. Gipps, M.D. Ambrose, D. Lenihan, D. Wadsworth, C.J. Bhuta and G.D. Salomonsson, 1999, *Privatisation and Performance-based Building Regulations: Are They Cost Effective?*, Report for Building Control Commission by CSIRO, September, pp. 54-56; KPMG, 2000, *Impact Assessment of Major Reform Initiatives*, Final Report, February, pp. 1-2; Productivity Commission, 2004, *Reform of Building Regulation*, Research Report, November, pp. 81-87.

In relation to the use of performance-based solutions, a CSIRO survey of building permit applicants (mainly building companies, but also developers, owner-builders, building owners and architects) and building surveyor in Victoria in 1999 found that performance-based solutions were being used to some extent (chart 4.5).

4.5 Use of performance-based BCA



Data source: S.N. Tucker, P.G. Gipps, M.D. Ambrose, D. Lenihan, D. Wadsworth, C.J. Bhuta and G.D. Salomonsson, 1999, *Privatisation and Performance-based Building Regulations: Are They Cost Effective?*, Report for Building Control Commission by CSIRO, September, p. 25.

Similarly, a report by the Department of Industry, Science and Resources estimated that in 1999 around 10 per cent of building work utilised performance based, alternative building solutions. The report also noted that it tended to be the larger scale projects that utilised performance based solutions. The authors considered that this indicated the advantage of the simplicity and relative cheapness of the prescriptive, deemed to satisfy solutions on smaller construction projects.

Both of the CSIRO and the DISR reports were published only three years after the introduction of the performance based code.

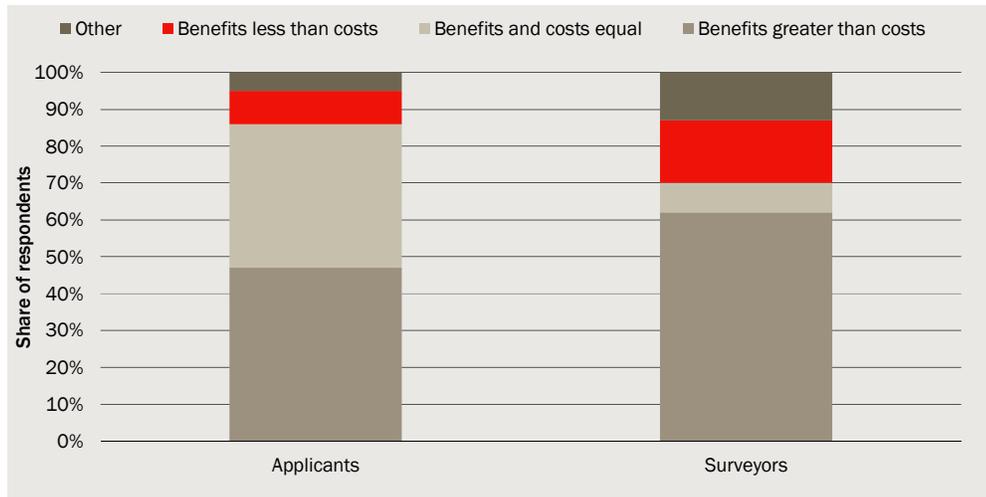
The CSIRO survey also found that applicants and surveyors felt that the benefits of using performance-based solutions mostly outweighed the costs, or the benefits and costs associated with using performance-based solutions were equal. Relatively few survey respondents felt that the benefits of using performance-based solutions were less than the costs (chart 4.6). Relatively few applicants (18 per cent) and surveyors (15 per cent) felt that the use of performance-based solutions increased the functionality of the building, although even fewer (2 per cent of applicants and 1 per cent of surveyors) felt that functionality decreased (S.N. Tucker et al, 1999).

A more recent survey of building surveyors undertaken by the Productivity Commission indicates that performance-based regulation has (chart 4.7):

- encouraged greater innovation;
- allowed cost savings;
- encouraged industry up-skilling;

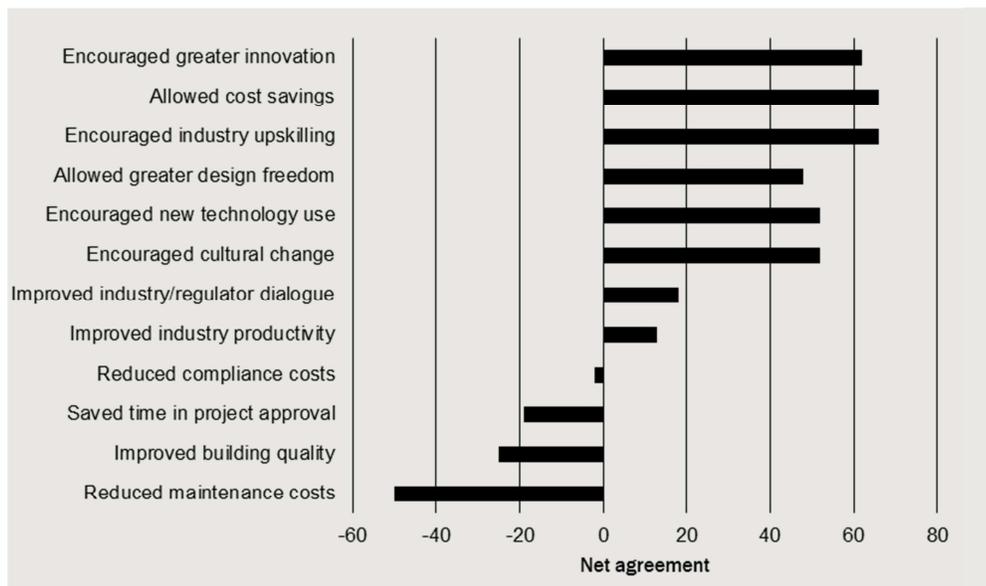
- allowed greater design freedom;
- encouraged use of new technology; and
- encouraged cultural change in the industry.

4.6 Net benefits of using performance-based solutions



Data source: S.N. Tucker, P.G. Gipps, M.D. Ambrose, D. Lenihan, D. Wadsworth, C.J. Bhuta and G.D. Salomonsson, 1999, *Privatisation and Performance-based Building Regulations: Are They Cost Effective?*, Report for Building Control Commission by CSIRO, September, p. 28.

4.7 Productivity Commission survey results – performance-based regulation



Note: Net agreement measured as the percentage of respondents that agreed with the statement less the percentage of respondents that disagreed with the statement.

Data source: Productivity Commission, 2004, *Reform of Building Regulation*, Research Report, November, p. 55; The CIE.

A small net percentage of surveyors also agreed that performance-based regulation has improved industry/regulator dialogue and improved industry productivity. Surveyors were relatively evenly divided on whether performance-based regulation has reduced compliance costs.

On the downside, surveyors disagreed that performance-based regulation has saved time in project approval; improved building quality; or, reduced maintenance costs.

Case studies

There have been various case studies used to demonstrate the benefits of performance based solutions. Some of these case studies are summarised in (table 4.8). Where cost savings from the use of performance-based solutions were able to be quantified, they were generally around 1-5 per cent of the total construction cost.

4.8 Case studies on the benefits of the performance-based code

Development	Key findings
KPMG case studies	
Brisbane Convention Centre (\$200 million)	<ul style="list-style-type: none"> ▪ This development was completed prior to the introduction of the performance-based building code. Nevertheless, there were 28 variations from DTS. <ul style="list-style-type: none"> – This would have been much simpler under the performance-based code. A tremendous amount of building survey and design time would have been saved, although this did not delay construction. ▪ The use of performance-based solutions necessitated a shift from passive to active protection and maintenance, with increased responsibilities for owners and occupiers.
Crown Casino Complex	<ul style="list-style-type: none"> ▪ While the Crown Casino Complex was constructed prior to the introduction of the performance-based code, performance-based design solutions were still possible. <ul style="list-style-type: none"> – There were 650 variations from DTS provisions sought and approved by the Victorian Building Appeals Board. The cost of these applications etc. was estimated at \$140 000. ▪ The performance-based design solutions are estimated to have saved: <ul style="list-style-type: none"> – \$28 million in construction costs (including the cost of delays); and – \$4 million per year as annual inspections are not required..
Docklands Stadium	<ul style="list-style-type: none"> ▪ Performance based solutions mainly related to fire design. ▪ Cost savings were estimated at 3-5 per cent. <ul style="list-style-type: none"> – The project may not have gone ahead under a DTS regime. ▪ Fire modelling entailed considerable time and expense.
Olympic stadium	<ul style="list-style-type: none"> ▪ Building approval was provided prior to the performance-based code being implemented. <ul style="list-style-type: none"> – Variations under the NSW legislation allowed the same outcome. – However, the process would have been less time-consuming under the performance-based code. ▪ Only half a dozen variations were submitted, mainly relating to fire safety. ▪ No cost saving estimates were provided.
State Library of Victoria (\$300 million)	<ul style="list-style-type: none"> ▪ Compliance with DTS provisions would not have been possible, given the functionality required. ▪ Performance-based design elements mainly related to fire safety. <ul style="list-style-type: none"> – Cost savings were estimated at around \$3 million, or around 1 per cent of the construction costs. ▪ However, the performance-based approach required more effort, more skill and more expertise to implement. No cost data were kept.

(Continued next page)

4.8 Case studies on the benefits of the performance-based code (Continued)

Development	Key findings
Sydney Superdome	<ul style="list-style-type: none"> ▪ Compliance with DTS would have reduced functionality. ▪ There were cost savings relating to performance-based fire safety solutions, but these were not quantified.
Star City Casino	<ul style="list-style-type: none"> ▪ The Star City Casino was constructed prior to the implementation of the performance-based code. <ul style="list-style-type: none"> – Nevertheless, there were 28 variations from the DTS provisions sought under section 82 of the NSW Local Government Act. Of these, 26 were granted. – Variations related to the size of the carpark (that is, functionality) and fire compartment restrictions. ▪ Cost savings were estimated at: <ul style="list-style-type: none"> – \$1 million in respect of the car park and hotel; and – \$3–4 million relating to fire safety. ▪ Extra design and approval costs were estimated at \$500 000.
Westfield Hornsby Shopping Centre (typically around \$200-\$250 million)	<ul style="list-style-type: none"> ▪ Performance-based solutions mainly related to fire safety requirements. ▪ Overall cost savings from the use of performance-based solutions were estimated in the range of 3-4 per cent of overall project costs. This included: <ul style="list-style-type: none"> – cost savings relating to the overall structure (excluding services of approximately 0.75 to 1 per cent
Westfield Hornsby Shopping Centre (typically around \$200-\$250 million)	<ul style="list-style-type: none"> – service savings were estimated at around 0.5 per cent; and – an increase in leasable retail space of 1000 m³ (of a total of around 90 000 m³); ▪ There were also time savings, compared to the prescriptive BCA. The previous system was time consuming and discouraged applications for variation. ▪ There were not estimated to be any increases in maintenance costs as a result of using performance-based solutions.
Federation Square (\$280 million)	<ul style="list-style-type: none"> ▪ Given the size, configuration and functional requirements, the Federation Square development would not have been able to be built under the DTS provisions. <ul style="list-style-type: none"> – 650 modification submissions were made. Only a small number were not granted. ▪ Cost savings were estimated at \$18.67 million, including \$18 million in avoided delays and \$0.67 million in capital costs.
Sydney GPO (\$249 million)	<ul style="list-style-type: none"> ▪ Performance-based fire modelling was used. As with other fire engineering solutions, the maintenance of the Fire Safety Plans requires enforcement and inspection and hence cost to ensure compliance. ▪ The use of performance-based design solutions allowed the refurbishment of the building without compromising or altering the heritage aspects of the building. ▪ There were also significant cost savings, although these were not quantified.
Landmark Centre (\$100 million)	<ul style="list-style-type: none"> ▪ The performance-based solutions mainly related to fire safety, based on fire modelling. ▪ Use of performance-based solutions allowed preservation of heritage aspects of the building. ▪ Likely to also have been cost savings, but these were not quantified.
Museum Victoria (\$160 million)	<ul style="list-style-type: none"> ▪ Performance-based code allowed alternative methods of construction which enhance flexibility in design and assessment, encourage innovation, reduce need for modifications, appeals and objections. ▪ Allowed cost savings, but these were not quantified.

(Continued next page)

4.8 Case studies on the benefits of the performance-based code (Continued)

Development	Key findings
National Gallery (\$220 million)	<ul style="list-style-type: none"> Performance-based solutions were necessary to meet the size, configuration and functional requirements. This would not have been possible using DTS provisions. Performance-based solution delivered improved fire safety.
University Square Development at Melbourne University (\$300 million)	<ul style="list-style-type: none"> The architects could not have achieved the required design options under DTS. Cost savings were achieved, but were not quantified.
Other case studies	
Three case studies referred to in CSIRO (1999)	<ul style="list-style-type: none"> Savings in the range of 1.85–5 per cent of construction costs.
National Gallery of Victoria (\$65 million)	<ul style="list-style-type: none"> Use of fire engineering tools resulted in the use of unprotected steel for the structure of the building. Reduced construction costs by around \$3 million, or 4-5 per cent of the total project costs. <ul style="list-style-type: none"> Also saved several thousand dollars per year in ongoing maintenance.

Source: KPMG, 2000, *Impact Assessment of Major Reform Initiatives*, Final Report, February, pp. 27-56; S.N. Tucker, P.G. Gipps, M.D. Ambrose, D. Lenihan, D. Wadsworth, C.J. Bhuta and G.D. Salomonsson, 1999, *Privatisation and Performance-based Building Regulations: Are They Cost Effective?*, Report for Building Control Commission by CSIRO, September, p. xx; The BRITE Project, Innovation Case Study No. 4: Performance-based Building Codes and Fire Engineering Yield Innovative Design Solution, CRC Construction Innovation, p. 2; TheCIE.

Other evidence

A range of other evidence on the benefits (and also costs) associated with the performance-based code has also been presented. Stakeholder interviews undertaken by CSIRO (1999) found that the use of performance-based solutions delivered the following:

- Time savings — performance based solutions potential resulted in significant time savings:
 - Although many residential builders reported little use of performance-based solutions, some of the more specialist home builders reported use of performance-based solutions and savings of around 3–4 weeks on modifications that would otherwise have had to be submitted for approval.
 - Significant time savings of 6 months to a year on some commercial buildings, where the use of a specialist report provided by an engineer negated the need to go to the appeals board.
- Cost savings — nearly all commercial builders interviewed said they considered performance based options on most projects, with the aim of reducing the project cost. Several commercial builders reported savings of up to \$300 000 on projects valued between \$20–\$40 million. Cost savings for residential builders were generally reported to be small.
- Savings in effort — mainly related to eliminating the need to prepare submissions to the appeals board.

- Intangible benefits — the flexibility under the performance-based BCA has allowed designers and builders to be much more innovative in their solutions to problems.

Estimated benefits

There have been several attempts at quantifying the benefits of the performance-based BCA. An ex-ante estimate reported by the BBRT suggested that a performance-based national building code would deliver benefits of around \$200 million per year.

There have also been a range of subsequent studies. The CSIRO for the Victorian Control Commission in 1999 estimated that in Victoria, the performance-based BCA delivered benefits of between \$58.4 million and \$157.5 million per year. This was based on:

- Estimated cost savings achieved through use of performance-based solutions of 1.85 per cent of total project costs when direct, indirect and maintenance costs are factored in. This was based on published case studies showing cost savings of between 1.85 per cent and 5 per cent. A survey undertaken as part of this study found reported cost savings over a wide range, including 0.1 per cent, 1.5 per cent, 3.3 per cent and 29.0 per cent for commercial buildings (S.N. Tucker et al, 1999)
- Non-residential turnover of \$2.5 billion and ‘other residential’ turnover of \$654 million. CSIRO estimated that

The KPMG study estimated the national benefits of the performance-based BCA were around \$64 million. This was based on a saving of 0.5 per cent on outlays on non-residential buildings, which amounted to \$12.8 billion in 1996–97. The magnitude of the cost savings was considered conservative and was based on the findings from a series of case studies, indicating cost savings ranged between 1 and 5 per cent (KPMG, 2000).

Based on the findings of the CSIRO and KPMG reports, the Allens Consulting Group suggested that the benefits of performance-based standards are worth around \$646 million (ACG, 2002). These estimates are summarised in table 4.9.

4.9 Estimated benefits from the performance-based BCA

Study	Year	Jurisdiction	Industry segments affected	Cost saving		Benefit
				\$ million	Per cent	
BRRT	1991	Australia		n.a.	n.a.	200
CSIRO	1999	Victoria	Other residential Non-residential	3 200	1.84	58
KPMG	2000	Australia	Non-residential	12 800	0.50	64
Allens Consulting Group	2002	Australia	Residential Non-residential			646

Source: S.N. Tucker, P.G. Gipps, M.D. Ambrose, D. Lenihan, D. Wadsworth, C.J. Bhuta and G.D. Salomonsson, 1999, *Privatisation and Performance-based Building Regulations: Are They Cost Effective?*, Report for Building Control Commission by CSIRO, September, pp. 54-56; KPMG, 2000, *Impact Assessment of Major Reform Initiatives*, Final Report, February, pp. 1-2; Productivity Commission, 2004, *Reform of Building Regulation*, Research Report, November, pp. 81-87.

National Construction Code

There have been two recent studies attempting to quantify the benefits and costs of the NCC. These are the 2009 Decision Regulation Impact Statement, outlining the expected regulatory impacts of the move to the NCC, and the Productivity Commission's chapter on the NCC in its review of COAG's business reforms, published in 2012.

Due to the inherent uncertainty of modelling expected costs and benefits, both of these studies rely heavily on modelling assumptions, stakeholder expectations of proportional productivity benefits and previously published analyses of building regulation reform. The Productivity Commission report also draws heavily on the 2009 decision RIS.

Regulation impact studies for the national construction code

A three-step process was implemented to draw out the expected regulatory impacts of developing a national construction code in Australia. The first step was the publication of a business case for a national construction code, which was published in 2008 (but not publicly released) and considered the proposals to integrate plumbing, electricity and telecommunications in to the then BCA. The three benefit elements that were considered for analysis were:

- a reduction in the costs associated with inconsistent or impractical technical requirements — across the building code and the plumbing/electrical/telecommunications code;
- increased consistency in adopting technical standards across States and Territories — within the plumbing/electrical/telecommunication code; and
- increased efficiency in administration of the technical requirements across the States and Territories.

The predominant finding of the business case report was that the main areas of expected benefits would be drawn from the integration of the PCA and the BCA, with the other trades, electrical and telecommunications expected to achieve much lower levels of benefits, and possibly negative net benefits. The expectation of reduced or limited benefits from integrating electrical and telecommunications requirements was driven predominantly by differences in the current regulatory processes, namely that telecommunications standards are under Commonwealth jurisdiction, not State or Territory jurisdiction, and electrical regulators tend to have a much broader role in electrical safety that extends beyond the installation process.

The second and third steps in the process were the publication of a Draft and a Final Regulation Impact Statement (RIS), considering the impacts of integrating the BCA with the PCA — the option considered most likely to achieve net benefits, based on the results of the Business Case report. The main qualitative findings of the RIS process were as follows.

- Inconsistencies in technical requirements in the PCA across jurisdictions were considered more detrimental to the industry than inconsistencies between the PCA and the BCA — national consistency in plumbing requirements were expected to generate greater benefits (ACG, 2008).

- While there were inconsistencies and overlaps found between the BCA and the PCA, these were not considered prohibitive or extensive. Further, it was found that these inconsistencies were more likely to occur in non-residential buildings when performance-based solutions were utilised, driven by changing boundaries and definitions in construction practices (ACG, 2009).
- Increased government focus on social and political objectives within the building code – sustainability and disability access, for example — was considered a major driver of the benefits of integration of the PCA and BCA. That is, a stand-alone PCA was not considered a sufficient mechanism to meet these changing government objectives,
 - Due in part to the NPRF not having the same level of resources as ABCB to review systematically, update and improve national consistency of the PCA.

The main finding from the RIS process was that the majority of the costs associated with the NCC would be administrative, with \$28.3 million of transition costs for industry to get up to speed with the changes, \$6.5 million for plumbers to purchase the NCC, and \$4.5 million of government transition costs. Total costs were estimated at \$39.6 million, predominantly as once off transition costs (the only annual recurring cost is the annual purchase of the updated NCC Volume Three).

When moving to quantify the benefits of the NCC, the Decision RIS found that “industry stakeholders did not consider that the potential for efficiency gains was very large, but perhaps in the order of 2-3 per cent”. However, noting that the expected benefits of the NCC are not as easily quantified as the costs, the Decision RIS opted for a break-even analysis to support the findings and did not use the 2-3 per cent estimate. Using ABS 2008 estimates of the value of non-residential construction of \$27.9 billion annually, the report concluded that a very small efficiency gain of 0.14 per cent was required across the entire non-residential construction industry, to meet the expected costs of the NCC, \$39.6 million.

The Decision RIS also notes that the extent of the benefits of the NCC depend heavily on the actions of regulators and the ABCB in the future, for example, leveraging the single governance structure of the BCA and the PCA to promote greater administrative consistency across the jurisdictions and reducing variations.

Commonwealth Government regulation review

In 2012, the Productivity Commission estimated that up to \$1 billion of annual savings could be expected through the integration of the PCA into the BCA. In the wider context of the study, the Productivity Commission estimated that approximately \$3 billion of annual benefits may be expected to flow from 14 COAG National Economy Reform items, the vast majority — one third — of which have been attributed to the NCC alone. Table 4.10 outlines the expected benefits from the national reform items, including the NCC.

4.10 Estimated reductions in business costs from COAG business regulation reforms

COAG reform	Realised and prospective benefits (\$m per year, 2010-11 dollars)
Consumer law and product safety	880
Consumer credit	45
Personal property securities	70
Trustee corporations	4
Standard business reporting	60
Payroll tax	30
Occupational health and safety	480
Rail safety	16
Health workforce	160
Trade measurement	5
Food regulation	1
Wine labelling	29
Development assessment	225
National construction code	1 050
Total direct impacts	3 055

Source: Productivity Commission (2012) Impacts of COAG reforms – Business Regulation.

The Productivity Commission quantifications are based on the 2009 Decision RIS for the NCC (the 2-3 per cent possible productivity improvement suggested by stakeholders), as well as utilising previous studies into the benefits of a national and performance-based building code. The expected proportional benefits used in the Productivity Commission estimates are as follows:

- 1 2 per cent reduction in construction costs in the non-residential sector, where there is a higher proportion of performance-based construction;
- 2 0.5 per cent reduction in construction costs in the residential sector, where there is limited use of performance-based construction;
- 3 Additively, in the non-residential construction sector, it was estimated that plumbing may account for 10 per cent of the construction costs and this sector may achieve up cost reductions up to 3 per cent from the use of a performance-based plumbing code.

In total, these estimates equate to an annual benefit to the Australian economy of \$1.05 billion, more than 26 times higher than the expected costs of the NCC as estimated through the RIS process. Table 4.11 provides a consolidation of the Productivity Commission base numbers and estimates. One of the key results in the table is that plumbing in the non-residential construction industry is subject to a double productivity increase, firstly from being associated with the non-residential construction industry, which achieves a 2 per cent improvement, and then as a sector on its own, non-residential plumbing achieves a further 3 per cent productivity increase.

Overall, the Productivity Commission has estimated that the non-residential construction industry could achieve up to 2.3 per cent savings from integrating the PCA with the BCA, and the non-residential plumbing industry could achieve up to 5 per cent.

4.11 Summary of Productivity Commission estimates of NCC benefits

Sector	Industry value	Percentage savings	Value of savings annually
Non-residential construction as a whole	\$34.8 billion	2 per cent	\$696 million
Residential construction	\$48.6 billion	0.5 per cent	\$243 million
Additional plumbing component of non-residential construction	\$3.48 billion	3 per cent	\$104.4 million
Total non-residential construction industry savings (additive)	\$34.8 billion	2.3 per cent	\$800.4 million
Total plumbing industry savings	\$3.48 billion	5 per cent	\$174 million

^a Note that final two rows were not outlined in the PC report and are TheCIE's calculations based on PC methodology. Source: TheCIE.

Review of published studies

Ex-ante quantitative studies are extremely difficult, especially when they are looking at changes that affect mainly efficiency based measures that are not readily observed, or quantifiable. This was the main reason that the 2009 RIS implemented a breakeven analysis and did not attempt a full cost benefit analysis.

There are a few points that may be made in light of the Productivity Commission quantification of the expected benefits of the NCC, noting that the PC did outline that these figures were exploratory and had required some judgements to be made about the reforms and their expected impacts on the industry.

Firstly, in 2000, KPMG estimated that a national performance based code for the entire building industry could achieve between 1 and 5 per cent cost savings for large-scale building projects because of increased efficiencies in design and construction. These are the cost efficiencies that were expected from the step change in building regulation from the implementation of the BCA at a national level. Estimates of 2 per cent cost savings across the non-residential construction sector raise the profile of the plumbing industry reforms to the same level as reforms to the entire Australian construction industry.

Secondly, the PCA was already a performance-based document, aiming to improve consistency across jurisdictions and was already being called up by the majority of Australian jurisdictions — Victoria, Queensland, South Australia, Tasmania and ACT. While there were noted levels of inconsistency remaining, and limited resources of the NPRF to adjust them, RIS stakeholders had noted that these inconsistencies were not extensive, nor were they prohibitive. Indeed the only conflicts that were articulated in the PC report were 1) different referenced standards for fire hydrants and fire hose reels, and 2) requirements for taps to comply with disability standards (the plumbing code requirements are stronger than the building code). The only concrete example of possible costs was reports of laundries having to be removed and replaced.

With respect to the figures published in the ACG Decision RIS, if the majority of the benefits were expected to flow only to the non-residential plumbing industry (and not the wider non-residential construction industry), results indicate that non-residential plumbing would require a 1 per cent productivity increase to cover the costs of the NCC changes. This is in contrast to the significantly smaller 0.14 per cent across the entire non-residential construction industry.

5 Have the expected benefits been realised in the minds of stakeholders?

The positive findings of studies presented in chapter 4 are reinforced by contemporary finding from stakeholder consultations conducted for this study. Of 24 stakeholders interviewed, all expressed the view that the Building Code of Australia and performance-based standards had provided net benefits to industry, designers, regulators and consumers. However, a large majority also thought that the full potential of the national code and the performance-based standards had not yet been fully realised. Ongoing jurisdictional variations, variations in interpretation, application and enforcement, interference by councils, utilities and land developers and a lack of objectivity in standards are some of the main factors considered to be limiting the full potential of the reforms being realised.

A large majority of stakeholders (particularly builders, lobby groups and designers) also thought that both the net benefits and the potential net benefits of performance-based standards were considerably greater than the likely gains from the national code itself (at least twice as large). That said, this consideration was tempered by strong concerns (of regulators particularly) about how performance-based standards are evolving. The proposition behind this is that performance-based standards are being used mainly to find alternative solutions that reduce costs. The concerns around this relate to whether the testing and approval of alternatives is adequate to ensure quality standards are not being compromised and therefore imposing hidden costs.

Few stakeholders presented strong views on the inclusion of plumbing and the development of the National Construction Code. Those that had strong views were generally positive of the inclusion and no stakeholders presented strong negative views. The majority of benefits were expected to accrue to administration and regulation processes in the plumbing industry, rather than to on-site plumbing or the wider building industry.

Detailed findings from the stakeholder consultations follow.

Stakeholders included regulators, construction companies, designers and lobby groups representing builders and property users. A discussion paper outlining a number of issues and propositions was prepared and presented to stakeholders before consultations. In interview, stakeholders were asked to comment on the points raised in the discussion paper. A list of the propositions and questions put to stakeholders is included as appendix A.

Single National Technical Code: findings

Box 5.1 outlines the two main categories of advantages that stakeholders pointed to when considering the single national technical code — economies of scale and economies of scope.

5.1 Advantages of the single national technical code

Economies of scale

- Reduced duplication in regulatory administration.
- Easier and cheaper compliance for industry.
- Cheaper design through spreading fixed costs and easier transfer of skills.
- Cheaper products developed, for example windows.
- Reduced uncertainty in being able to build to a widely accepted standard.

Economies of scope

- Better regulation:
 - rigorous assessment methods used: regulation impact statements;
 - regulation rationalised: optimal minimum standards identified;
 - fewer unnecessary variations and constraints: reduced fragmentation;
 - better designed and tested technical standards;
 - convergence replaced divergence: national objectives promoted cohesion;
 - international standards considered: to aid trade;
 - more inclusive, extensive and confident stakeholder engagement:
 - … more certainty;
 - … clear objectives to innovate towards;
 - industry more empowered to deal with clients/councils;
 - private and better certification promoted;
 - platform laid to allow performance-based standards.
- Better buildings and better building companies:
 - national market encourages innovation/testing and new materials;
 - national standards help underpin nationally focussed companies;
 - computer aided design (CAD) facilitated: helps with codification;
 - national competition enhanced:
 - … spread of design;
 - … best ideas win through;
 - … skills transfer.

Stakeholder support on economies of scale

Most regulators agreed that creating a single national building code had substantially **reduced administration costs** over time. Annual payments to support the ABCB were considerably less than what each jurisdiction estimated would be required to maintain and update a similar quality code for their jurisdiction. Some quantified this as being worth as much as a million dollars per jurisdiction per year.

Most industry representatives consulted pointed to some advantage in areas of **compliance, design, skills transfer and cheaper products** through more streamlined planning, procurement and delivery operations that allow for the spreading of fixed cost. Whilst it is recognised that a national code is of most advantage to larger firms operating nationally, having a national code also provides more certainty for materials suppliers to design and manufacture to meet standards more cheaply, which provides flow-on advantages to smaller firms and consumers as well. Termite protection products and the improved energy efficiency of windows are examples of such products.

Stakeholder support on economies of scope

Most stakeholders placed more emphasis on the economies of scope created by a national code rather than economies of scale. These economies of scope relate to devising better regulation and standard setting, better building products, better ways of doing things, better building companies and ultimately better, safer and more innovative buildings.

- The pooling of effort toward creating regulation and standards at a national level not only reduced duplication, but also meant **a higher level of technical, economic and stakeholder scrutiny** brought to bear in assessing and creating standards. This provided for a more inclusive and exhaustive process in which industry has more confidence and which provides a higher level of certainty about the standards to build and innovate towards. Reductions in uncertainty alone are equivalent to a reduction in costs.
- With the creation of a national process, emphasis was also placed on **harmonising with international standards** where appropriate. This is important in a context of globalisation especially for an industry that traditionally was largely non-traded, but which increasingly is facing opportunities for import and export of building products.

According to some stakeholders who lived through the transition from state-based to a national BCA, the commitment to creating the BCA helped energise and support a much needed, long overdue process of rationalisation of state-based regulation, some of which dated back to the early periods of Australia European colonisation. This helped to remove unnecessary and out-dated constraints and establish optimal minimum standards (rather than 'gold' standards). A higher level of scrutiny was then applied in the future through centralised processes such as conducting regulation impact statements, and, although many variations remained at first, the process provided a pathway to gradually diminishing these over time.

'...at first the pages of variations were greater than the BCA itself, but through time the variations have diminished and are now relatively few.'

- An important new and better regulation formulation process that **emphasised convergence** toward a single national goal replaced one that allowed divergence toward separate state-based goals and therefore fragmentation. This created a subtle force that created pressures to avoid divergence and fragmentation unless it could be reasonably justified, or, where it could not be reasonably justified, divergences emerged as future targets for reform.
- Another subtle force mentioned by some stakeholders was that a national code helped **empower industry** to reign in temptations of councils, utility providers, land developers and to some extent state-governments to pursue expensive (often politically-based) parochial objectives lying outside the normal definitions of the national public interest. Although not always successful, the code acts as a tool that places national discipline and consideration on local authority.
- Some stakeholders also argued that the BCA and the rationalisation processes that led up to it also paved the way to **better and more efficient certification and enforcement** of standards, especially private certification. Private certification removes a layer of political interference in enforcement, it removes delays and better attracts the technical skills to have this work done well.
- Another forceful argument made by some stakeholders was that the BCA led to **developing modern, best practice institutional processes** based on a regulatory culture ultimately centred on performance-based standards. These were necessary to underpin an innovation culture in business to cope with a fast changing world.

Several industry stakeholders emphasised that establishing a national market gave additional impetus to developing new building products and better ways of doing things.

- A national building code has made it possible to focus on seeking **national applications of new products** and tools such as computer-aided design as well as making it sensible to develop designs for a national market. This helps make it viable to invest more resources to develop better products, tools and designs.¹ Such improvements may provide productivity benefits in terms of fewer inputs per square metre of building, more square metres of useful building per unit of input through eliminating dead space and better more comfortable square metres of useable area per unit of input.
 - The ABCB website lists over 60 new products that have currently valid codemark seals of approval.
 - Codification of BCA deemed-to-satisfy solutions within computer-aided-design is easier to achieve and use with one code instead of several and means the design is transferable throughout Australia.
- The nationwide standardisation made possible by the BCA has increased the viability of **integrating the code into entire design, procure, build and deliver systems**. This has helped underpin nationally focussed companies, providing both economies of scale

¹ Imagining software programs that are able to incorporate all elements of design and construction to consider where services may be in conflict at the construction stage — for example, the design of roof space services now exist. These software programs are able to incorporate technical requirements from a single national technical code that allows wider use of design solutions.

and scope and enhanced competition by more companies operating across Australia. This enhances competition and the spread of designs with better designs winning through. Skills transfer between jurisdictions is also assisted, helping to spread new ideas and better ways of doing things more rapidly.

Stakeholder concerns

Box 5.2 outlines some of the main concerns that stakeholders raised around the single national technical code, those areas which are considered to be constraining the benefits being achieved from a single code.

5.2 Concerns around the single national technical code

- Remaining variations limit economies of scale — interpretation varies by state.
- Councils/utilities obstruct use by imposing separate and additional standards.
- More consistency would enable more certainty and cost reductions.
- Enforcement/compliance may compromise benefits of BCA:
 - not enough certifiers;
 - code is not user-friendly — too many standards, take up is low;
 - evidence on compliance is mixed:
 - ... input indicators = bad (not getting certification);
 - ... outcome indicators = good (not many bad structural problems);
- Only half the potential of the code is being realised.
- Partly vulnerable to political capture (energy efficiency) but can opt out.
- Silent on maintenance.
- ABCB not strategic enough:
 - needs refreshing/rationalisation zeal — needs more political cohesiveness;
 - evolving into lesser document;
 - inconsistency with other state regulations;
- Imports escaping proper certification (bolts/glass) — would be a problem anyway.
- Insufficient emphasis on property and costs.

A large number of stakeholders felt that the full potential of the BCA was not being realised due to on-going state-based variations and interference from local authorities. The separate standards and conditions imposed by councils and utilities obstruct the use of the BCA standard, make designs less transferable, cause delays, can require expensive dispute resolution and impose uncertainty which is costly.

Another key concern was gaps in compliance and, where there are gaps; enforcement may not always be possible. Many builders do not own a copy of the code, it is expensive to buy and use in its complete form because it calls up so many separate standards. A

related point raised on multiple occasions was that the code is difficult to use because it is **not mobile phone or device friendly** and is difficult for small builders to keep up with.

Several stakeholders raised concern about whether the ABCB is able to act strategically enough to adequately and quickly update the standards and to provide strong enough **independent leadership to continue rationalising and improving the code**. Some stakeholders also thought a single national code was, more vulnerable to capture by political lobby groups.

- Energy efficiency star ratings was raised as a case in point where even though the regulation impact statement showed that a national six star rating was not economical for the housing industry, the objective was pursued. That said, it was noted that separate jurisdictions do maintain the option to opt out of sections of the code, and that several jurisdictions have already done so on the six star rating standard.
- Some stakeholders noted also that lack of objectivity in setting standards tends to leave the code vulnerable to interpretation and open to capture. **The code is best and most useful where it is highly objective and measurable**. Achieving energy efficiency standards can for instance become very expensive because of ambiguities about measures of energy efficiency for particular sites, home designs and likely patterns of use. Six star homes with one star residents might be a waste of resources and money.

A common concern among stakeholders was that some imported building components were **meeting certification standards on paper but failing in practice**. Examples of bolts sheering and glass shattering and falling from high rises were raised. Although a certification problem that might arise irrespective of whether there was a national code, failure of the certification scheme may tend to limit confidence in the BCA to achieve its operational objectives.

Some stakeholders made the point that a weakness of the code was that it was silent on maintenance. Although a building may certify as meeting the requirements of the BCA upon completion, it may fail in time due to lack of maintenance. Liability for the failure might become ambiguous around the point of maintenance. Moreover, responsibility for maintenance may not be made clear leading to failure of the building performance.

The BCA's emphasis on life safety in the case of fire rather than on protection of property and costs of construction may mean holistic solutions are not sought. This may lead to higher insurance costs and in some cases unnecessary costs of construction.

Other issues: single national technical code

- Applies equally to residential and other construction.
- Make it free to encourage use.
- Helped by private certification.
- Paved the way for PBS.

Overall

- **Half a per cent productivity gain likely due to the single national code.**
- **Economies of scope more important than economies of scale**

Among the stakeholders that were willing to offer views about the potential net benefits of the single national code, all agreed that, while difficult to measure, these benefits are likely to be relatively small. They are likely to be small because the single national technical code makes up a relatively small part of the regulation affecting and constraining the sector (perhaps 20 to 30 per cent), and council, utility and state-based variations mean the full potential gains are not being achieved.

From the information provided by stakeholders, the net benefits are likely to translate to productivity increases for the entire building sector of less than one per cent and more likely around half a per cent.

Performance-based standard (PBS): findings

Box 5.3 outlines the advantages that stakeholders identified as accruing to a performance-based building code, distinct from a single national technical code. These advantages fell in to two main categories, increased access to cost saving processes, and increased encouragement of innovation in design, products and construction.

Stakeholder support on cheaper solutions: PBS

Most stakeholders could identify cost savings achieved through design and development of alternative solutions in **commercial and multi-residential complexes**. Mostly such **savings related to fire safety**. Cheaper configurations of sprinklers and smoke detectors could often be devised whilst still meeting the performance requirements. Sometimes the savings could amount to hundreds of thousands of dollars in multi-million dollar buildings, but achieving the design and certification is often also expensive.

Where savings are found they might amount to savings of between one and ten per cent of costs. However because they are not achieved in all cases and rarely in stand-alone residential building, across the whole industry such savings may translate to overall industry productivity increases of around half a per cent.

Other areas of application are in trying to more cheaply achieve energy efficiency requirements, structural engineering and waterproofing. In some cases, alternative solutions are **used retrospectively to solve disputes over non-compliance** with a DTS provision or to overcome a particular problem that has arisen during construction.

A number of large building companies argued that the net benefits of using alternative solutions purely to reduce construction costs are likely to be less than the net benefits of using alternative solutions innovatively to create more useable space (square metres) per unit of input or better quality, more valued, space per unit of input.

5.3 Advantages of the performance-based code

Savings through rationalisation — cheaper solutions

- Design and certification costly but only used because private benefits exceed costs.
- Fire may be area of greatest application.
- Half a per cent productivity gain likely.

Innovation made more viable and more and better space created: PBS

- New and better ways of doing things:
 - has helped in discovery of new products for energy efficiency;
 - absolutely necessary to make the most of CAD;
 - has made new building and design systems possible and cheaper;
 - always conscious to find and test alternative solutions;
 - can find solutions to overcome conflicts in complex designs;
 - creates a more challenging environment, creates more testing of ideas;
 - pushes the envelope outward and aids international competitiveness;
 - develops design skills in Australia to enhance industry competitiveness;
 - more progressive buildings aid competitiveness of whole economy;
 - PBS are now built into the design process to find competitive advantage;
 - is part of an integrated design, procurement and delivery supply model;
 - certifiers work alongside designers;
 - innovation and one off solutions required in bespoke buildings/difficult sites;
 - PBS required to meet new amenity, sustainability and affordability objectives;
 - alterations/renovations getting bigger — needs PBS/alternative solutions;
 - opens the door to rapid take-up of new (international) technology;
 - could achieve PBS previously, but more expensive, now faster to achieve;
 - states would not have innovated so quickly.
- Removed constrained thinking and road blocks: promotes innovation.
- Enhances competition:
 - new ideas win through;
 - good ideas get picked up and spread;
 - creates an innovation culture;
 - stops monopolies (for example, Unions) forming around DTS solutions;
 - skills transfer.
- Worth between double and 10 times the benefits from BCA alone.

Stakeholder support on innovation: PBS

All industry stakeholders regarded PBS as necessary and vital in promoting innovation, particularly in commercial and multi-residential building. Most indicated that PBS has become an **integrated part of the whole design, procure, build and deliver system** of commercial and multi-residential building.

- In design, although deemed-to-satisfy (DTS) solutions are used predominantly, in 10 to 20 per cent of cases alternative (PBS) solutions are sought and used.
- Designers are fully conscious of the need to find and test alternative solutions as they bid for work, when they develop their designs and when they have to resolve conflicts as each building is constructed. Moreover, certifiers work alongside designers throughout the process to test and verify good alternative solutions.
- To realise the full potential and power of computer-aided-design (CAD), PBS has been necessary. Without it CAD applications would face severe constraints and designing would take longer and be more expensive and building would also be more expensive or less fit for purpose.
- Design industry representatives also noted that to some extent, PBS has made it possible to design buildings from first principles and use the building code and PBS in the latter stages to ensure compliance, which is a less constrained approach.

Most industry stakeholders also indicated that PBS have been vital in ensuring Australia has a **challenging and competitive commercial construction environment**. By its very nature PBS creates incentives to develop and test new ideas and pushes outward the envelope of possibilities. This aids international competitiveness in the industry itself but also provides important flow-on benefits to businesses that need modern, progressive, world-class building solutions in which to conduct work and through which to attract customers. Moreover, in a fast changing, increasingly urbanised and densely populated economy PBS are required to meet new amenity, sustainability and affordability objectives of society. Increasingly, innovation and one off solutions are required in bespoke buildings and for difficult (often smaller) sites, as well as for the increasing amounts of refurbishment and renovation work conducted which is often not amenable to DTS approaches.

Other advantages mentioned by industry stakeholders were that PBS facilitates the rapid **take-up of new (international) technology** by removing constraints that DTS solutions would impose. Accepting that without the PBS market pressures would continue to mount for the introduction of innovative new solutions, most industry stakeholders expressed the view that PBS facilitated and fast tracked take-up. For a small nation like Australia, most innovation in building will arise overseas. Having a mechanism that positively encourages innovation means Australia can more fully integrate with the global building sector. It also empowers the building industry to find alternative solutions to get around roadblocks that might be put in their way by local authorities or other potential monopolies. Several stakeholders made the point that a number of buildings and their particular designs would simply not have been possible or economical without PBS.

- In one case study (Brookfield Multiplex 2012) presented of a \$200 million building, its unique exoskeleton structure and innovative heating, cooling and air conditioning

designs relied highly on PBS and alternative solutions provided measurable environmental, social and economic benefits.

- Benefits included large reductions in emissions, better quality air, more flexible and fit-for-purpose spaces with high perceived worker productivity outcomes, reduced fit-out costs and 20 per cent more useable area.
- Benefits could be worth over \$100 million over 10 years. Discounted to a net present value measure, this gain might be equal to \$70 million. By one measure, this could be equal to about a 35 per cent lift in productivity for the \$200 million dollar building. Not all of the 35 per cent can be attributed to the PBS, however, construction of the building in its eventual design would not have been possible under DTS solutions.

Most regulators agreed that the PBS was important for innovation, but their knowledge of its benefits and enthusiasm for it was generally more muted than it was for industry stakeholders.

Many industry stakeholders indicated that they regarded the net benefits arising from PBS innovations to be multiples of the net benefits arising from the single national technical code. This might suggest productivity gains of at least one or two per cent for the industry. That said, the **benefits are mainly restricted to the commercial and multi-residential sectors**, and, other stakeholders hold concerns about whether alternative solutions may be compromising standards and therefore imposing hidden costs. However, as with the single national technical code, many stakeholders were of the view that perhaps less than half of the full potential of the PBS had been realised due to constraints imposed by other aspects of regulation and local authority requirements.

Stakeholder concerns: PBS

Box 5.4 outlines some of the main concerns that stakeholders raised about PBS.

Stakeholders representing regulators (in particular) expressed a number of strong concerns about PBS and alternative solutions achieving certification. The main concerns appear to be whether there is sufficient truly independent verification and testing of alternative solutions. A view among many regulators is that PBS and alternative solutions focus mainly on cost saving strategies rather than innovation² and that without wider scrutiny, their use could compromise standards.

Although there is no hard evidence of obvious failure, there are concerns about the process and the incentives embedded in PBS. Several stakeholders also pointed to the manifestation of a PBS failure in the case of New Zealand's notorious leaky building episode (see box 5.5). Here an alternative solution led to the take-up of a foreign product that proved unsuitable to New Zealand's damp conditions. Systemic and costly problems resulted from this. Some stakeholders are worried that Australia may be promoting alternative solutions that will lie dormant for years but which will, eventually, reveal themselves as dangerous and expensive problems.

² This is at variance with the views of many industry stakeholders who emphasised the high value of PBS encouraging innovation. The results of innovation may be less transparent except to those closest to the commercial decisions involved in construction.

5.4 Concerns about performance-based standard

- Retrospectively used to justify non-compliance.
- Substandard imported products made possible.
- Standards declining — waterproofing a problem.
- Higher maintenance costs imposed potentially.
- Regulators failing to keep up (expensive — constraining).
- Certification costs higher.
- Insurance costs higher.
- No reservoir of PBS emerging to promote efficiency.
- Councils/utilities can be restrictive and limit applications:
 - alternative solutions may not be easily transferable;
 - can be unnecessarily costly to transfer same solution.
- Contingency costs may be rising:
 - NZ leaky buildings cost \$11 billion;
 - not visible until systemic which could happen.
- Many uses are more for dollar savings than design — cutting corners.
- Lack of scrutiny:
 - need peer review;
 - need holistic approach to double check and find problems before systemic;
 - need to maintain confidence in the system;
 - standards eroding.

Several stakeholders put forward the view that a more holistic and comprehensive review of alternative solutions was needed given various emerging problems (see box 5.6). Peer review was mentioned several times as the sort of comprehensive review model needed. Some argued this would be necessary to maintain and bolster confidence in PBS and alternative solutions. Both industry and other stakeholders are all mindful of the already high costs associated with certifying and developing alternative solutions.

- For some there is the argument that these high costs and even **higher costs from peer review may be worth it to avoid possible systemic problems** and that a mechanism is needed to make alternative solutions more transferable to spread their fixed costs of certification over a wider number of applications.
- For others the commercial imperative already exist to ensure transferability is taking place adequately and that if there is to be any form of peer review perhaps it should be conducted through a **government financed construction research institute**.

5.5 New Zealand leaky buildings

Through the 1990s and early 2000s in New Zealand, the use of monolithic cladding building products for residential houses became widespread. These products were introduced as a cheaper construction product under an alternative solution under the building regulations. However, in 2002 the Building Industry Authority established a Weathertightness Overview Group to investigate wide spread claims and evidence that these cladding products were not installed properly, used outside of their specifications and used with untreated kiln-dried timber framing, all of which worked together to increase the risk of water penetration and rot.

Over the intervening years, many commissioned studies and newspaper outlets have attempted to estimate the scale of the problem both now and in to the future, Estimates have put the number of affected houses at approximately 30 000 monolithic clad houses having been constructed in NZ between 1992 and 2004. Estimates of repair bills nationally run to \$11 billion that could accrue over the coming 20 years.

These repair costs have been estimated to be equivalent to a 1.8 per cent productivity shock to the New Zealand construction industry (Layton, B 2011, referenced in Zuccollo and Hensen 2012).

While there was no one clear cause of the failure of the building regulations to prevent the leaky building crisis, issues that were found to have contributed to the problem include (Mumford, 2010):

- A very competitive building environment, which created an imperative to cut costs, also led to the cutting of corners;
- A lack of professional trade skills and judgement;
- A lack of effective supervision and inspection — buildings were being built using a series of sub-contractors, with no one having responsibility for overall quality control;
- An emphasis on the product, not the building system. In this case the cladding product, not on whether that cladding, in that particular design, in those particular weather conditions, would keep the water out;
- A lack of sufficient guidance in acceptable solutions and verification methods;
- Consumers who were not informed enough about the implications of the choices they were making;
- Failures in the regulatory back-stop, which ranged from inadequate consenting and inspections by territorial authorities, through to inadequate monitoring of outcomes by the BIA.

5.6 Risk triangulation of performance-based building regulations

A performance-based building code is considered to be as strong as its supporting institutions. As observed in the NZ leaky building incident, where there are a few supporting institutions that have underlying operational issues, there is a compounding risk of damaging issues to spread undetected.

There are a number of concerns across Australia's supporting institutions that may warrant consideration to strengthen the protection offered to the building industry, owners and regulators. Strong commercial pressures to minimise costs and maximise outputs is known to be driving changes in most areas of the building industry, including certification, product compliance and general construction practices.

Market for private building certification

In December 2011, the Victorian Auditor General (Vic AG, 2011) found that private building surveyors were not adequately fulfilling their reporting obligations, leading to a decline in confidence that the building industry was being properly supervised. The findings of the report included:

- 96 per cent of examined permits did not comply with minimum safety standards;
- there was widespread confusion and inadequacy of practice and a lack of transparency and accountability for decisions; and,
- significant potential for collusion and conflicts of interest.

While the conclusions of the report do not consider the evidence on building compliance with the regulations — it is only an input based analysis — it does raise valid questions around the traceability of building compliance records. However, there is no hard output based evidence of systemic failure in Australia.

Product compliance

Over the past 6 years, there have been increasing reports of non-compliant building products entering the Australian construction market. These include structural steel bolts, structural plywood products, copper pipe tubing, fire collars, steel reinforcing for concrete and glass sheets. These issues of non-compliance are compounded by: lag from when representations are made and product failure in buildings; unclear liability laws; and, difficulty in tracing suppliers for imported products.

Disconnection on-site

Through the consultation period, a number of stakeholders referred to an increasing trend of builders 'working from their phones'. That is, builders increasingly becoming trade coordinators, sourcing and managing a group of sub-contractors remotely to do the construction work. While this trend may be an efficient scale based specialisation of labour, there is some trepidation that this trend, combined with rising concerns over diminishing skill levels in associated trades, could open up areas of increased vulnerability due to reduced supervision on-site.

For industry stakeholders the main concerns related to restrictions from councils and utilities and their limited ability to appreciate the value of alternative solutions and so restrict their application. This reduced the transferability of solutions and designs unnecessarily raising costs and higher utility floor space. The problem of local councils was also acknowledged by a number of regulators.

With the increased emphasis on PBS as a policy guide for building regulations, many stakeholders have noted the removal of DTS provisions from the code completely. See box 5.7 for an overview.

- There is increased difficulty in referencing the NCC as it is **no longer drafted as a 'go to, reference manual'** and is instead becoming a high level policy document outlining performance objectives, and a list of applicable Australian Standards that must be referenced in turn.
- Where Australian Standards are referenced, these **standards often cover a broad range of factors that are not applicable to the building industry**, it may therefore take time to seek out and find the relevant section of the standard that is required for the job.

The residential construction industry, housing especially, has voiced particular concern over the move away from publishing accepted construction practices in the code, and increased reliance on external referencing to Australian Standards.

- The **differences between the larger commercial constructions projects (including multi-unit residential projects) and house construction** has been recognised for many years and, for simplicity and functionality, a more complete, standalone code is preferred for housing.
- A main difference between housing and larger commercial constructions is the **limited popularity of alternative solutions in housing** construction driven both by the relative cost effectiveness of alternative solutions and market demand for alternative solutions by house buyers.

Many stakeholders noted that the **availability of educated surveyors and regulators** that are able to keep abreast of improving building technology and innovation patterns is critical to the effectiveness of PBS. So too is a **well-functioning, nationally consistent liability system** that clearly identifies the roles of each participant and the extent of their responsibility should anything go wrong. Concerns were raised about both of these issues.

Lack of quantification in the performance objectives and confusion around the definition of 'expert judgement' (which is allowed when 'physical criteria are unable to be tested or modelled by calculation) were indicated as other problems, making it difficult to design, assess and verify the compliance of alternative solutions with the performance objectives.

Further, stakeholders from across the spectrum expressed concern over the **authenticity of certification of some imported components** and believed that without more testing and scrutiny, low quality imported inputs could threaten the efficient functioning of PBS.

5.7 Concerns and costs of external standard referencing in the NCC

The removal accepted construction practices references and DTS provisions within the NCC is seen to be an effect of increased focus on performance objectives in the NCC. Concerns around the role of Standards Australia's interactions with regulators and industry access to standards through SAI Global have been expressed for a number of years. Most recent reports include the Business Case for a NCC (ACG, 2008) and the Productivity Commission's report on Standard Setting in Australian (PC, 2006). In particular, increased reliance on Standards Australia and associated Code Committees as referenced documents in the NCC has led to the view that these institutions are acting as quasi regulators where they are making decisions on standards that are referenced by regulations (ACG, 2008).

Beyond concerns of influence, stakeholders also noted the reduced accessibility of the NCC and increased cost of referencing all external standards, as outlined below.

Access costs for the NCC, PCA and Australian Standards, November 2012

Section of the NCC and standards access	Format	Cost	Supplier
Full NCC and all referenced Australian Standards	Online	\$2157	SAI Global
	DVD	\$2370	
Only NCC referenced Australian Standards	Online	\$1982	SAI Global
PCA and Volume three referenced Australian Standards	Online	\$685	SAI Global
	DVD	\$742	
Only PCA referenced Australian Standards	Online	\$616	SAI Global
AS3500 Plumbing and Draining set	Hard copy	\$242	SAI Global
NCC only	Hardcopy and online	\$399	ABCB
BCA (NCC volumes one and two) only	Hard copy and online	\$315	ABCB
Residential housing provisions (NCC Volume two) only	Hard copy and online	\$180	ABCB
PCA only	Hard copy and online	\$120	ABCB

Source: TheCIE, compiled from SAI Global and ABCB websites

The NCC purchased as a stand-alone document through ABCB costs \$399 with online access to all standards referenced in the NCC is available from SAI Global, for 12 months for \$1982 — a total cost of \$2381. More economical access to the package is available through SAI Global directly, where 12 months online access to the NCC and all standards is \$2157, or a DVD version (to allow access in subsequent years) is \$2370. The cost of the Australian Standards far exceeds the cost of the NCC.

Volumes two and three of the NCC are purchasable individually. However, where the residential housing provisions are purchasable individually, there is not a comparable set of reduced price standards available through SAI Global. Therefore, for a \$180 upfront cost for the hard copy Residential Housing Provisions, an additional \$1982 is required to gain 12 months online access to the Standards referenced in the complete NCC. For DVD access, for longer than 12 months, the full NCC plus referenced standards must be purchased through SAI Global for \$2370.

Other issues: PBS

- Applies mostly to commercial, not residential
- More about systems than products
- Helped by private certification
- The fire authorities raised concerns around the conflicting objectives of the NCC to protect life, and the fire legislation requirements to protect life and property, especially when they are called on to review alternative solutions.
 - There have been some reports of fire authorities issuing guiding documents on the characteristics that are expected to be included in plans and designs that will be reviewed by the authorities.

Overall

- **Consensus view of one to two per cent productivity gain likely due to performance-based standards**
- **Mostly applicable to commercial building and multi-residential construction**
- **Innovation more important than cost savings**

National Construction Code: findings

The expected benefits and outcomes accruing from the NCC as outlined by stakeholders, listed in descending order of importance, include:

- increased scrutiny and rigour in plumbing regulation administration;
- improvements in the plumbing design elements of larger performance-based buildings;
- some onsite benefits to plumbers, allowing disputes to be amended on site through the use of performance-based solutions;
- minimal impact on the wider building industry.

Advantages of the national construction code

Box 5.8 outlines the observed and expected benefits stakeholders raised around the national construction code. It is important to note that while economies of scale may be seen to have already begun to be achieved, the economies of scope with respect to better and more comprehensive regulation are still to be reaped in the future.

5.8 Advantages of the national construction code, for the plumbing industry

Economies of scale

- Reduced duplication in regulatory administration for plumbing, but noting that the PCA was already widely adopted nationally.

Economies of scope

- Better regulation:
 - more rigorous assessment methods used: regulation impact statements;
 - reduced fragmentation across the building trades;
 - better designed and tested technical standards;
 - convergence rather than divergence: national objectives promote cohesion;
 - more inclusive, extensive and confident stakeholder engagement;
 - industry more empowered to deal with clients/councils;
 - private and better certification promoted.
- Better products:
 - national market for innovation and testing of new products and materials;
 - computer aided design (CAD) facilitated: helps avoid clashes with trades.
- Platform for performance-based solutions:
 - makes the most of CAD and overcome conflicts in complex designs;
 - helps to meet new amenity, sustainability and affordability objectives;
 - opens the door to rapid take-up of new (international) technology.

A limited number of stakeholders ventured an opinion on the national construction code, which was attributed to both its reasonably recent introduction and stakeholders suggesting that its effect on the wider building industry is limited. Further, where advantages were considered, they were in the main identified as accruing to plumbing regulation and administration rather than the on-site plumbing industry. Economies of scale in code development were cited as beneficial, leveraging off the work already undertaken by the National Plumbing Regulators Forum. The role of the NCC and the ABCB in solidifying this national plumbing code was considered important.

In terms of economies of scope, regulators and industry representatives alike were optimistic about the ability of the NCC to deliver improved regulation outcomes. For example, reducing the (isolated) areas of fragmentation between the previous BCA and PCA, as well as introducing a higher level of analytical rigour in evaluating proposed changes to the plumbing installation standard, AS3500 and the wider plumbing code.

Concerns

Table 5.9 outlines the concerns that stakeholders raised around the NCC.

5.9 Concerns around the national construction code

- Still variations limit economies of scale — interpretation varies by state.
- Regulators failing to keep up (expensive — constraining).
- Possible conflicts with other State regulations, including scope of work and licensing.
- Conflicting views on expanding the NCC, some stakeholders see benefits in a complete NCC including electrical and telecommunications, others point to difficulties in legislative arrangements and the scope of the NCC to cover non-building activities.

These concerns predominately stemmed from the state and territory based legislation that affects and interacts with the plumbing regulations and codes. This fragmentation is limiting the national take-up of the PCA through the NCC. For example, where Western Australia has not adopted the performance-based sections of the PCA, this is reportedly due to limitations in plumbing certification and oversight regulation in the state. Where plumbing work is self-certified, there is no mechanism for oversight of performance-based, alternative plumbing solutions currently.

In such cases, stakeholders and other regulators have pointed to alternative acceptance and verification processes that may be followed; however, these are not being taken up by all states and territories, resulting in a lag in innovation and national introduction of selected products.

Discussion of the expansion of the NCC to include gasfitting, electrical and telecommunications was limited to very few stakeholders but with contrasting views being voiced – some outlining the benefits to the building industry from integration, and others voicing uncertainty over the vastly differing regulatory oversight, especially with vertically regulated electrical industries for example.

Overall

- **May be potential to avoid minor clashes with other parts of building.**
- **Main benefits to accrue to regulation and administration, not on-site plumbing or wider building industry.**
- **Possibly only 70–80 per cent of gains achieved so far.**

6 Quantifying the benefits of reform

When analysed using a model of the economy, productivity changes attributed to building code reforms can be used to assess the net economic benefits of those reforms. Productivity changes take account of both changes in the cost of inputs as well as changes in the level and value of output per unit of input. They therefore take account of costs and benefits so the net change represents a net benefit (or cost for negative productivity effects).

In chapter 3 it was shown, using TheCIE construction sector model, that a one per cent increase in total factor productivity in the residential and commercial building sectors conveys net benefits to the economy of around \$607 million a year in 2012 dollar terms. Here we use TheCIE model of the Australian economy to assess net economic benefits (measured as increases in household consumption, see chapter 3) of the three major building regulation reforms – drawing on stakeholder impressions and previous studies.

Interpretation of stakeholder impressions of benefits

Indicators provided by stakeholders point toward small to moderate (but unambiguously positive) increases in productivity across a number of areas. A summary of our interpretation of stakeholder information is set out in table 6.1.

6.1 Interpretation of stakeholder views on productivity gains

	BCA		PBS				NCC
	%		%		%		%
	Low	High	Commercial		Residential		Most likely
Lower costs							
Reduced inputs/output	0.05	0.30	0.50	1.00			0.05
Innovation							
Reduced input/output		0.10					
Increased output/input	0.10	0.30	0.25	2.00		0.1	0.05
Increased quality/output	0.10	0.30	0.25	2.00			
Total range	0.25	1.00	1.00	5.00			0.1
Most likely		0.5		2.5		0.1	0.1
Potential achieved		50.0		50.0		50.0	75.0

Source: TheCIE.

What stands out in table 6.1 is that the greatest productivity gains are expected to arise from performance based standards in the commercial and multi-residential sectors. These range from 1 to 5 per cent with a most likely gain being around 2.5 per cent.

- There are definite savings arising from finding cheaper ways of doing things (lower costs — reduced inputs/output).
- There are considerable, but less certain and less detectable, gains likely to arise from innovation solutions that lead to more useable floor space per unit of input (increased output/input) and better quality, more attractive spaces per unit of output (increased quality/output). The scope for innovation on the output side provides for some upside in the estimates.

The gains from the national BCA (single national technical code) alone have less upside and the most likely gain appears to be around half a per cent. Notably, this expected gain is for residential and commercial sectors whereas the gains for performance-based standards were applied mostly to the commercial and multi-residential sectors only.

In contrast to the BCA and PBS, the incremental productivity gains from the NCC are relatively small. Largely, this is a joint result of:

- stakeholder assessments that the changes would predominantly affect the plumbing industry, and even then, on-site productivity improvements are expected to be reasonably small, and;
- plumbing costs are a relatively small proportion of total construction costs.

Therefore, a one per cent productivity improvement in plumbing would translate to less than a 0.1 per cent increase in productivity for the whole construction industry.

The productivity gains set out in table 6.1 translate into substantial gains in annual household consumption. These results are set out in table 6.2. The annual net benefits range from a low of \$408 million to a high of \$2.2 billion, with the most likely net benefit indicated as \$1.1 billion. In net present value terms, using a discount rate of 7 per cent, these sum to between \$5.8 and \$31.3 billion over time, with a most likely net gain to the economy in perpetuity of \$15.7 billion.

6.2 Interpretation of stakeholder views on productivity gains

	BCA		PBS				NCC	Total	
	\$ million		\$ million		\$ million		\$ million	\$ million	
	Low	High	Low	High	Low	High	Most likely	Low	High
Lower costs									
Reduced inputs/output	30.4	182.2	147.6	295.2			30.4		
Innovation									
Reduced input/output		60.7							
Increased output/input	60.7	182.2	73.8	590.30		40.5	30.4		
Increased quality/output	60.7	182.2	73.8	590.30					
Range	151.8	607.4	295.1	1 475.8	0.00	40.5	60.7	408	2 184
(Equivalent industry wide productivity shock)									(0.67% 3.6%)
Most likely	303.68		737.9		40.5		60.8	1 102	

Source: TheCIE.

Of relevance too is the fact that stakeholders thought that only about 50 per cent of the potential of the national code and the performance-based standards had yet been realised. This suggests that there may be potential to double net benefits if the constraints mentioned in chapter 5 could be lifted.

Contemporary assessment of previous studies

Most previous studies attempting to quantify the gains from the national building code and performance-based standards were conducted over a decade ago. The economy was then much smaller, but the productivity gains suggested by those studies were similar to those suggested by stakeholders (see table 6.3 and table 6.1). Table 6.3 also converts those productivity gains to annual increases in household income using TheCIE model to put them on a comparable basis with table 6.2. The range of potential benefits measured in 2012 dollar terms and for Australia's now \$1.4 trillion economy are in the range of \$300 million to \$1.5 billion a year a year. In net present value terms these convert to \$4.3 and \$21.4 billion in perpetuity. In dollar terms, these net benefits are generally consistent with the indications given by stakeholders.

6.3 Interpretation of productivity improvements: previous studies

Report	Productivity increase	Increased household consumption: CIE model results (\$m)
Industry Commission (1995)	1.5 per cent for all building reform	941
University of Tasmania (referenced in IC 1995)	2.25 per cent for all building from reduced delays	1 366
Victorian Building Control Commission (1998)	1.85 per cent performance based standards	546
CSIRO (1999)	1 per cent for commercial builders for performance based standards	295
KPMG (2000) Various case studies	1 to 5 per cent for commercial buildings from performance-based standards	295 – 1 476
Productivity Commission (2012)	2 per cent for non-residential, 0.5 per cent for residential construction and 3 per cent for plumbing	850

Note: Numbers generated from CIE's in-house model utilising productivity shocks from published studies, PC (2012) figures also remove double counting of plumbing benefits.

Source: TheCIE.

Plausibility of the results

Although there is no single (or definitive set of) macro indicator(s) available to assess the benefits of building regulation reform, it is useful to check the consistency or otherwise of some indicators as a check on the plausibility of the results. Three such indicators worth assessing are:

- the relative importance of the various contributors to productivity growth over the period;
- any change in use of inputs over the period consistent with the regulatory reform;

- the plausibility of cost changes to achieve gains of various case studies suggested to us by stakeholders.

Productivity growth

Since the introduction of the BCA in the 1990s, the productivity of the construction industry has increased by around 25 per cent or about 1 per cent a year compound growth. Moreover, it has out-performed the average of the rest of the economy over that period. Much has contributed to this growth.

- A study by Independent Economics (2012) attributes a lot of this gain (up to 15 of the 25 per cent) to improvements in workplace relations over the period.
- Improved technology, materials and ways of doing things.
- Better designs.
- Better and more flexible regulation.

In 2004, the PC listed the drivers of innovation in the Australian construction industry, in declining order of importance, as:

- innovative products, such as prefabricated walls;
- increased integration of information technology with traditional equipment;
- internet and email connectivity increasing awareness of innovation elsewhere; and,
- more flexible regulation; and,
- new building design.

What is notable about this list is that while regulation is included it is by no means prominent. Moreover, the building code of Australia is only a part of the full weight of regulation affecting the industry. Some stakeholders have suggested that construction regulation accounts for less than 30 per cent of all regulation affecting the industry. Local government regulation, occupational health and safety and industrial relations regulations are also drivers of industry performance.

If a large proportion of the 25 per cent productivity growth is attributable to improvements in workplace relations and the rest is distributed evenly among other drivers of growth, increases in productivity attributable to reforms in regulation affecting the building code would be around 1 to 3 per cent. This is reasonably consistent with the collective views of stakeholders.

Change in input use

Industry stakeholders and evidence from others suggests that in commercial construction the incidence of use of expensive performance-based solutions is between 10 to 20 per cent with relatively cheaper deemed-to-satisfy solutions used otherwise. Because of the expense of using performance-based approaches, the decision to use them is not made lightly. They are only used where it is likely to convey a commercial advantage in terms of reduced cost, increased floor-space or more saleable (desirable)

space. How much companies are willing to spend on alternative solutions is therefore an indicator of the value of the solution.

Even without quantifying how much they may be spending, the fact that the incidence of use of performance-based solutions is 10 to 20 per cent suggests this must confer important benefits. Moreover, to qualify as 'important', it is reasonable to assume their use is likely to at least convey a one per cent advantage or productivity boost.

Compared to larger commercial constructions, stakeholders and regulators noted that single house constructions rarely utilise alternative solutions in design or construction. This is mainly due to the relatively small value of project construction costs compared to the costs of developing, submitting and proving an alternative solution, and the relatively limited scope for alternative solutions to be utilised. These statements are supported by recalling that industry stakeholders and observers report that in commercial constructions — where alternative solutions are more prevalent — the vast majority of alternative solutions are used for fire safety measures and, even then, they are predominantly utilised for cost savings.

The differences between the larger commercial constructions projects (including multi-unit residential projects) and house construction has been recognised for many years, including in the BRRTs 1991 report. Hence, limited benefits were expected to have accrued to residential construction from the PBS.

Plausibility of cost changes and claimed productivity change: fire safety

Some stakeholders suggested that productivity gains of around one per cent should be possible in commercial building from the application of performance-based solutions aimed at achieving cost savings. Fire safety was mentioned as one of the most likely areas where savings could be achieved. Whether such solution can achieve a one per cent productivity gain will depend of the share of fire safety in total costs and the size of the percentage savings in net costs expected.

In commercial and multi-residential building the costs of meeting fire safety requirements can be considerable. There is the plumbing of fire sprinkler systems, alarms and specified requirements of spaces and distances to exits as well as fire escapes. Some estimates put this cost at between 6 and 12 per cent depending on the type of building. High-rise residential buildings are likely to be at the low end of the range and health care facilities at the high end. The median might be around 10 per cent of costs.

Several stakeholders suggested that performance-based solutions to fire safety are being used in many new commercial and multi-residential buildings because the cost savings achieved far exceeded the costs of design and certification. Many examples of net savings in excess of 10 per cent were given. If costs are 10 per cent and a 10 per cent saving is achievable, this translates directly into a 1 per cent productivity improvement ($0.1 \times 0.1 = 0.01$). This is roughly consistent with stakeholder claims of a one per cent productivity potential from the PBS.

Plausibility of cost changes and claimed productivity change: plumbing

The discrepancies between the benefits estimated for the NCC here (approximately \$60 million per year) and those published by the Productivity Commission in 2012 (approximately \$1.05 billion per year) should be clearly noted.

While the Productivity Commission estimates are partly based on stakeholder views published (but not quantified) in the 2009 ACG Decision RIS for the NCC, the quantifications elevate the inclusion of plumbing in the BCA to the same, if not higher, level of importance as previous studies have held the industry wide reforms of a single national technical code and, more importantly, PBS reforms. This is inconsistent with the previous literature and stakeholder consultations carried out for this study.

There is possibly some confusion around what was being analysed in the Productivity Commission results. As the basis of their NCC productivity improvements, the PC's COAG reform study (PC, 2012) quotes previous ABCB and other commissioned study results that were actually measuring the benefits of a suite of building regulation reforms. Indeed the result of \$1.05 billion a year are in line with the current study's results of the full benefits of the suite of comprehensive building regulation reforms over decades. They are not consistent with understandings of plumbing regulation reform that would have some, but not sweeping, effects on the wider construction industry.

That said, the main stakeholder responses from industry and regulators to the NCC were optimistic around the potential of benefits to be achieved from the NCC in the areas of administration and regulation design/review but noting that there has been limited, if any, effect on plumbers on-site. Further, after more than 12 months of operation, the overall industry response to the NCC has been quiet — apart from concerns around product approval in some jurisdictions. Indeed, this is put down to a highly limited amount of performance-based plumbing work being undertaken across the sector as a whole, and when alternative solutions are proposed, it is rarely at the design stage, and is more likely to crop up during the construction phase where there are found to be clashes between the trades.

Overall, the current study, based on modelling the proportion of plumbing costs in the construction industry, and stakeholder expectations of gains, considers a fair estimate of the benefits to be a one per cent productivity improvement to an at most, ten per cent proportion of the construction industry.

These considerations are consistent with the expected costs of the NCC, as outlined in the ACG 2009 Decision RIS, of approximately \$40 million. Combined with the estimated benefits in the current study, the possible cost benefit ratio of the NCC may be around 1.5 to 2. This is consistent with a marginal regulation reform, compared with an implicit benefit cost ratio outlined by the Productivity Commission of 26 (\$1.05 billion over \$40million), which would imply the NCC was a dramatic step change in building regulation and policy, of the scale seen in the 1990s and 2000s.

7 Conclusion

Although there can be no definitive estimate of the net benefits of building code reforms, a fairly consistent picture has emerged from our triangulated assessment.

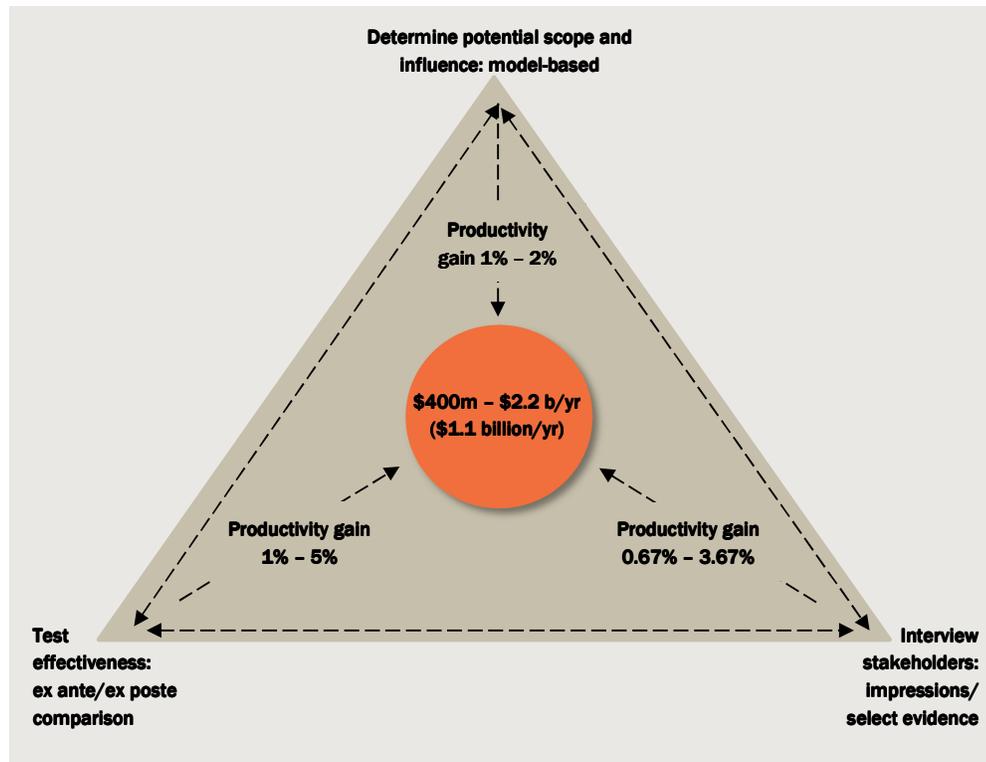
- A tops-down assessment of the magnitude of productivity gains that might emerge from microeconomic regulatory reform for the whole economy suggests that gains of around 1 to 2 per cent are plausible. Moreover, a specific tops-down assessment of productivity growth in the construction sector over the past 25 years which attempts to attribute gains to several important drivers also point to small but positive gains of 1 to 3 per cent.
- A bottoms-up comparison of the sorts of gains expected in studies conducted before implementation with those found in post-implementation case studies and from stakeholders post-implementation impressions elicited in this study suggest both that: where implementation proceeded as planned, expected gains have been realised and where proposed changes were not implemented gains have been missed. Post implementation case studies fairly consistently point toward small but definite productivity gains in the range of 1 to 5 per cent.
- All stakeholders interviewed for this study held strong impressions that reforms to the code had delivered small but definite positive contributions to industry productivity with the evidence presented pointing to gains of between 0.67 and 3.67 per cent.

TheCIE model of the construction sector converts the representative stakeholder range of such productivity gains (0.67 per cent to 3.67 per cent) to net economic benefits worth between \$400 million and \$2.2 billion a year in contemporary 2012 dollar terms. This points to a mid-point estimate of over \$1.1 billion a year (chart 7.1).

Among the three components of building code reform, stakeholder evidence and previous studies suggest that performance based standards have probably delivered around 70 per cent of the net benefits while the national code itself has delivered most of the rest. The inclusion of plumbing into the national construction code is accredited with providing only relatively minor benefits.

Because productivity measures and the model deal with net benefits, costs have been netted off. Nonetheless, the net benefits summarised above do not include contingent costs that may arise in the future. These are by definition difficult to assess however many stakeholders expressed concerns about the robustness of testing procedures, particularly of alternative solutions. A worry is that alternative solutions are being implemented and certified, but their success may only be fully tested through time. Should they fail, they may impose costs not included in the assessment of net benefits so far.

7.1 Consistently point toward net benefits of over \$1 billion a year



Source: TheCIE.

New Zealand's episode with leaky building is evidence that expensive systemic problems can emerge if testing procedures fail. In New Zealand's case, the cost of the problem has been calibrated to a negative productivity shock of around 1.8 per cent. Were a similar problem to emerge in Australia it would raise considerable doubts about whether the reforms, particularly the performance-based standards, deliver a net benefit. That said, in New Zealand, the problem occurred in residential property, whereas in Australia performance based standards are predominantly used in commercial building.

Some stakeholders held strong views that alternative solutions required closer and more comprehensive testing and review, possibly peer review.

Another cost not included in the estimates above relates to opportunity cost. Many stakeholders held the view that the full potential of building code reform had not yet been realised. The full suite of reforms originally proposed have not been implemented and on-going state variations and local government restrictions limit realisation of the potential to innovate under the code. Many stakeholders thought that potential existed to double the net benefits of the code if these limitations could be removed.

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APPENDIX A

Propositions and questions put to stakeholders

A.1 Nationally consistent BCA – questions for stakeholders

Proposition	Questions for stakeholders
Lower costs for builders and designer in complying with multiple building codes.	<ul style="list-style-type: none"> ▪ To what extent do building design and construction companies operate across state borders? Residential sector? Non-residential sector? ▪ To what extent do existing differences in the building code across different states and local government areas increase compliance costs for building design and construction companies? ▪ Are these differences a disincentive for building design and construction companies from expansion into new markets? ▪ Would compliance costs for builders and designers be higher if there were separate state-based building codes? How much higher? ▪ Would separate state-based building codes discourage design/construction companies from operating across state borders? ▪ What are the barriers to building and design companies expanding into new markets?
Better compliance with building regulations.	<ul style="list-style-type: none"> ▪ Does a nationally consistent building code improve compliance?
Larger market for building products.	<ul style="list-style-type: none"> ▪ What is the national process for getting new building products accredited? ▪ How many new building products have received national accreditation? ▪ Would differences in building codes across states discourage building product manufacturers from developing new products?
Transferability of building designs.	<ul style="list-style-type: none"> ▪ May be worth talking to one of the supermarket/department store chains ▪ Are building designs transferable across state borders? ▪ Would they be transferable without a national BCA? ▪ What are the cost savings involved in transferring building designs across states? ▪ What are the barriers to transferring building designs across states?
Transferability of skills.	<ul style="list-style-type: none"> ▪ Would differences in the building code across states discourage design/building practitioners from moving interstate or working across state borders? ▪ What would be the re-training costs associated with moving to a new state in the absence of a national code?
Savings in code development costs.	<ul style="list-style-type: none"> ▪ To what extent has the national BCA reduced code development costs for State Governments? ▪ To what extent has a national BCA increased the inclusive nature of code development, between government and industry, for example.

Source: The CIE and Productivity Commission, 2004, Reform of Building Regulation, Research Report, November, pp. 76-80.

A.2 Performance-based BCA – questions for stakeholders

Proposition	Questions for stakeholders
General	<ul style="list-style-type: none"> ▪ To what extent are performance-based solutions being used? On what percentage of total building work? Residential sector? Non-residential sector? ▪ What design/construction challenges are being addressed through performance-based design solutions? ▪ What are the barriers to using performance based design solutions?
Cost savings from more efficient design and construction	<ul style="list-style-type: none"> ▪ On average, what are the cost savings associated with using performance-based design, where used? What costs are saved through using performance based solutions? ▪ What are the additional design costs associated with using performance-based solutions?
More functional/aesthetic buildings	<ul style="list-style-type: none"> ▪ In what ways have performance-based design solutions made buildings more functional (if at all)? More lettable floor space? More aesthetically pleasing?
New building products and materials	<ul style="list-style-type: none"> ▪ To what extent does use of new products certified under the performance-based BCA reduce building costs? Improve building functionality?
More regular updating of DTS standards	<ul style="list-style-type: none"> ▪ Do innovations through the use of performance-based standards lead to more frequent updating of the deemed-to-satisfy standards?
Increased difficulty in assessing compliance	<ul style="list-style-type: none"> ▪ Does the use of performance-based solutions make it more difficult to assess compliance? Does this increase the cost of assessing compliance?
Higher maintenance costs	<ul style="list-style-type: none"> ▪ Can performance-based design solutions increase maintenance costs? In what percentage of cases? By how much, on average?
OH&S requirements/higher insurance costs	<ul style="list-style-type: none"> ▪ Can the use of performance-based standards affect OH&S requirements? In what percentage of cases? ▪ Does this lead to higher insurance costs? By how much, on average?
Higher energy/water consumption	<ul style="list-style-type: none"> ▪ Can the use of performance-based standards increase water/energy consumption of building users? In what percentage of cases? By how much, on average?
Well functioning support systems	<ul style="list-style-type: none"> ▪ What are the strengths and weakness of the support systems for performance based construction in Australia: such as insurance, liability, certification, approval and dispute resolution, registration.

Source: The CIE and KPMG, 2000, *Impact Assessment of Major Reform Initiatives*, pp. 1-2; Productivity Commission, 2004, *Reform of Building Regulation*, Research Report, November, pp. 76-87,.

A.3 National Construction Code – questions for stakeholders

Proposition	Questions for stakeholders
Reduction in overlap between PCA and BCA	<ul style="list-style-type: none"> ▪ What were/are the major areas of overlap between the PCA and BCA technical requirements? ▪ How often would issues of conflict between the technical requirements arise, and how would these be resolved?
Improved operation of performance based plumbing construction	<ul style="list-style-type: none"> ▪ To what extent is performance based construction used in the plumbing industry currently? ▪ What are the likely changes to this pattern in the future? ▪ How might the operation of performance-based plumbing change under the NCC compared to the PCA?
Integration with broader government policies of sustainability	<ul style="list-style-type: none"> ▪ What was the effect of including water heater requirements into the BCA, how was this integration managed with the PCA?

Source: The CIE