A Policy Framework for Zero Carbon Buildings in Australia

Phil Harrington[1]

This paper reviews the current dilemmas confronting building efficiency policy in Australia, outlining the factors that are inhibiting progress towards the necessary and achievable goal of zero carbon, or zero net energy, buildings. It notes that policy settings are deeply conflicted, with different arms of government working towards very different goals – with net result being a stalemate. Policy makers are also seemingly unsure how to respond to the paradigm shift that has hit them from left field, with the new-found cost-effectiveness of photovoltaic (PV) technologies in particular, and other embedded electricity generation technologies to a lesser degree.

Positive initiatives include tentative steps towards mandatory disclosure of building energy performance. Also, despite their many critics, building ratings schemes are leveraging significant improvement in building energy performance through both voluntary and mandatory measures. However, despite evidence that minimum performance standards for buildings are too low – dramatically so for commercial buildings – and that zero net energy is already a cost effective performance target for some building classes, ineffective governance arrangements for buildings policy nationally and a significant flaw in the Carbon Pricing Mechanism are holding back movement towards this goal. This paper proposes a '10-point plan' to get Australian buildings policy back on track.

1. Background and Context

1.1 Energy and Emissions Profile of Buildings in Australia

Buildings – or perhaps more accurately, human activity in constructing and using buildings – are a major source of energy consumption and greenhouse gas emissions in Australia, and also around the world. The International Energy Agency attributes around one third of global final energy consumption, and a similar share of global greenhouse gas emissions, to buildings (IEA 2011). In Australia, buildings' share of final energy consumption is much lower, due to the distribution of energy consumption being skewed towards minerals processing in particular. Also, official statistics in Australia are organised by economic sector and allow only approximations to be made with respect to buildings as an end-use for energy. On this basis, building use accounts for around 18.5% of final energy consumption in Australia, while the construction sector accounts for less than an additional 1% (RET 2011). The share of greenhouse gas emissions in Australia attributed to buildings is higher, at around 23% (pitt&sherry 2010), due to the predominance of electricity as the final energy carrier in buildings together with the very high greenhouse intensity of electricity generation in Australia, where brown and black coal dominate as the primary fuels. Further, the same

[1] Principal Consultant, Pitt&Sherry, GPO Box 94, Hobart TAS 7000

source cites ABARE data showing that total energy use in residential buildings more than doubled between 1973 and 2004, while total energy use in commercial buildings tripled over the same period.

There are excellent reasons to seek to reduce, and perhaps eventually eliminate, this source of energy use and greenhouse gas emissions.

1.2 The Climate Change Driver

First, and some six years ago now, the Intergovernmental Panel on Climate Change declared that "Warming of the climate system is unequivocal…" and that "Most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations" (IPCC 2007). Since then, and based on more recent scientific observations, research and modelling, some climate scientists are concerned that "BAU scenarios result in global warming of the order of 3 – 6^{o}C"; that "…goals of limiting human-made warming to 2^{o}C and CO_2 to 450 ppm are prescriptions for disaster"; and that "Rapid reduction of fossil fuel emissions is required for humanity to succeed in preserving a planet resembling the one on which civilisation developed." (J.E. Hansen and M. Sato, 2012).

1.3 The Energy Price Driver

Second, around the world, but very notably in Australia, energy prices have been rising strongly and are expected to continue to do so in future, albeit with some moderation expected in the short to medium term due to continuing weak global economic conditions and other factors. Electricity prices in Australia have increased most impressively in recent years, with nominal retail prices rising by 72.4 per cent in the five years to June 2012, equivalent to an increase of over 50% in real (inflation-adjusted) terms (Productivity Commission, 2012). Natural gas prices in Australia, retail or wholesale, are much less transparent than electricity prices and also show distinct variation by State. However, there is evidence that wholesale gas prices in Western Australia have more than doubled since 2009-10, while average retail gas prices have increased by over 40% in real terms since 1991 (AER, 2011). As a result the 'business case' for saving energy in buildings in Australia has never been stronger.

1.4 Efficiency and Abatement Potential of Buildings

Third, it is extremely well established that the technical and economic potential for saving energy in buildings is very large. A recent review of Australian and international literature in this area showed that international literature suggests that up to 70% of energy use in new buildings could be avoided in most OECD countries with no or very low incremental costs, while Australian literature is more conservative, with savings potentials clustering around 30% (pitt&sherry 2010). It should be noted that this literature focuses on energy efficiency and does not consider the potential for embedded generation from low or zero carbon sources to cost-effectively reduce the demand for purchased or networked energy in buildings.

A more recent reference examines more closely the potential for cost effective energy savings in Australian buildings, based on social benefit cost analysis and detailed, bottom up modelling of a wide range of building types, over the period to 2020 under a number of energy price, carbon price and other scenarios. This work finds that for new residential buildings, without PV, and in a reference scenario for energy and carbon prices, only some 16% of space conditioning energy consumption could be cost effectively saved by 2020, relative to the 2010 standard requirements, on average across Australia (pitt&sherry 2012). This value was significantly higher in some States where electricity prices are relatively high, for example, 36% savings were found to be cost effective in Perth, Western Australia. However, these results do not include the value of avoided energy network infrastructure savings – a key factor that is discussed further below. More importantly again, when PV was allowed as part of the building solution, the cost-effective level of savings rose to 100%. That is, zero net energy houses are shown to be cost-effective in Australia, indeed by 2015 or earlier in all States except those with the lowest electricity prices.

For commercial buildings, the 'reference scenario' level of cost effective savings (without PV), relative to 2010, is much higher than for residential buildings – 58% on average by 2015 and 68% on average by 2020. Again significant regional variations were in evidence, with the highest result being 80% in Darwin, Northern Territory (where electricity prices and ambient temperatures are high and (cheaper) natural gas is largely unavailable). For many commercial building types, the availability of PV or other embedded generation options does not make proportionately as much difference to the cost effectively level of energy performance as it does for residential buildings. With respect to PV, this is due to the often restricted façade area with appropriate solar access, but also higher energy densities, of commercial when compared to residential buildings.

However, the same study notes that for supermarkets, zero net energy is marginally cost effective. Supermarkets in Australia are cooling dominated, large and low-aspect-ratio 'box' form buildings, with limited glazing and significant internal heat loads from lighting and refrigeration adding to their already substantial cooling task. The study suggests that there is an expectation of significant improvements in the efficiency of lighting, refrigeration and space cooling energy technologies over the period to 2020. Further, these buildings almost invariably use (high cost, high carbon) electricity for 100% of their energy needs, and they also generally have excellent solar access for PV. It is the combination of all these factors that generates the result of cost effectiveness at a zero net energy performance level.

1.5 The Network Cost Driver

It was noted above that real electricity prices in Australia have risen by over 50% in just five years. While more than one factor has contributed to this outcome the Productivity Commission, amongst many other analysts, has noted that "Spiralling network costs are the main contributor to these increases, partly driven by inefficiencies in the industry and flaws in the regulatory environment." (Productivity Commission, 2012, p. 2).

While a full description of this issue is beyond the scope of the present paper, the fundamentals are that some 70% of the peak electrical load in Australia is attributable to

buildings and around two-thirds to residential buildings alone. Most climate zones in Australia experience wide diurnal and seasonal variations in temperature. Air conditioned commercial buildings are the norm, while residential air conditioning has grown strongly over the last decade or more. The percentage of households with air conditioners increased from 20% in 1970 to around 75% in 2011 (Productivity Commission, 2012b), and this is generally cited as the proximate cause of rising peak system loads in Australia. The cooling demand of buildings (and, to a lesser degree, heating demand of buildings in winter), is therefore by far and away the dominant driver of rising peak load, and rising peak load is far and away the dominant driver of rising electricity prices in Australia. The Productivity Commission has noted that "capacity that caters for less than 40 hours a year of electricity consumption (or under one per cent of time) accounts for around 25 per cent of retail electricity bills" (Productivity Commission 2012b, p. 301). This leads not only to higher than necessary electricity prices, it also creates poor productivity for investment in network assets and electricity generation. It should be understood as a misallocation of economic resources driven by poor market design.

However, we could express this conundrum another way. We could say – on the above evidence – that the demonstrably sub-optimal thermal performance of buildings in Australia, the non-realisation of the very large, demonstrated cost-effective potential for efficiency improvement in buildings, is the largest single cause of rapid growth in electricity prices in Australia, and also of rising energy demand and associated greenhouse gas emissions associated with buildings. Clearly, other factors are also at work. These will include rising incomes, larger houses (and commercial building space per capita), longer operating hours for commercial buildings, rising 'plug load' (notably electronic equipment) and standby power. An investigation of their role falls outside the scope of this paper.

Instead, this paper focuses on why – given the remarkably strong prima facie case for strengthening building energy efficiency policy in Australia – there appears to be little or no appetite for policy reform? Despite the opportunity to cost-effectively reduce energy consumption and costs for businesses and households alike, and despite the opportunity to realise cost-effective greenhouse gas emissions savings, in some cases all the way down to zero net energy or carbon – why is it that there seems to be little appetite or momentum for policy development?

2. Building Energy Efficiency Policy in Australia

2.1 A Potted History

It is not within the scope of this paper to provide a comprehensive history of buildings efficiency policy in Australia. Suffice to note that Australia embraced energy performance regulation of buildings late, at least at the national level. Some States, like Victoria and the Australian Capital Territory (ACT), had introduced some prescriptive requirements (such as insulation requirements) into their state Building Codes in the 1990s. The ACT introduced mandatory disclosure of residential building energy performance in 1999…something that has still not been implemented across Australia despite being agreed by the Council of Australian Governments in 2009 (NSEE 2009).

Building energy performance measures were first introduced for some residential buildings (Classes 1 and 10) in 2003 and for others (Classes 2 – 4) in 2005. Class 1 building requirements were lifted to 5-star (see below) at that time and to 6-star in the 2010 version of the Building Code of Australia. For commercial buildings, energy performance requirements were first introduced in 2006 and then lifted in 2010. In addition the scope of Code requirements has been broadened; for example, requirements for lighting energy density, hot water greenhouse gas intensity and pool pump energy usage were included for residential buildings.

There is some evidence that the stringency of both past and current requirements is modest, particularly for commercial buildings. For example, it was retrospectively calculated that the required social benefit cost ratio set as the 'hurdle rate' for commercial buildings in 2006 was a remarkable 4.9:1 (CIE 2009). This clearly indicates that much more 'benefit' (energy savings) could have been realised whilst remaining cost effective. More recently, the benefit cost analysis of future Code stringency (pitt&sherry 2012) indicated high benefit cost ratios for commercial buildings even in the very short term, suggesting that BCA2010 performance requirements were once again very conservative.

Also, it should be noted that individual states were then (and are today) given considerable latitude in both the timing of the implementation in their states of nationally-agreed performance measures in the Building Code of Australia, and secondly in making state-based 'variations' to these provisions, notionally to accommodate local factors. COAG first agreed to 6-star housing in 2008, for example, but this performance requirement will not be adopted in Tasmania until 2013, fully five years later.

Building ratings schemes deserve a brief mention in this context. The benchmark rating system for residential buildings is NatHERS (the National House Energy Rating System), developed and administered jointly by Federal and State/Territory governments since at least 1995, although other ratings tools have been developed (FirstRate, BERS). For residential buildings, energy performance requirements in the Building Code of Australia (or, more strictly, space conditioning energy consumption) is determined by reference to NatHERS star ratings levels, although other solutions (including a 'Deemed to Satisfy' or prescriptive route) are also accepted.

For commercial buildings, the NABERS (National Building Energy Rating System) is the most widely used energy rating tool, although the Green Star sustainability rating is also popular for premium buildings (and in any case draws on NABERS for its energy ratings component). NABERS underpins the mandatory disclosure regime for commercial buildings, known as Commercial Building Disclosure, but may not be used to demonstrate compliance with the energy performance requirements in the Building Code of Australia (Section J). Instead the Code uses a 'reference building' simulation approach.

Despite having many critics, it is clear that these ratings tools have a) enabled firstly a small market for building energy efficiency to be established on a voluntary basis; b) enabled a much larger market to evolve through mandatory application (BCA, and now Commercial Building Disclosure); and c) continue to support 'beyond minimum compliance' and best

practice on a voluntary basis, by providing a credible and reliable 'metric' for the measurement and demonstration of building energy performance.

In 2009 the Council of Australian Governments (COAG) endorsed a National Strategy on Energy Efficiency. This Strategy included, inter alia, the development of an 'integrated framework for national building energy standard-setting, assessment and ratings' (NSEE 2009). The Framework has the laudable goal "...to drive significant improvement in Australia's building stock through establishing a pathway for future increases in minimum building standards to 2020, and improving the approach to assessing and rating buildings" (DCCEE 2012). It is intended that the the Framework will:

- set increasingly stringent minimum building standards over time for new buildings and renovations
- cover all types of residential and commercial buildings
- apply to new and existing buildings
- cover the building envelope including roof, walls, doors and windows, as well as the energy efficiency of key building equipment and services
- aim to harmonise assessment and rating tools for existing and new buildings
- include common measurement and reporting methodologies to help in setting building standards and assessing building performance
- encourage innovation in meeting defined performance standards
- continue to communicate building performance using star ratings, and
- facilitate effective monitoring and compliance.

The process has proceeded from a policy commitment in 2009 to a Discussion Paper in 2010 to a Draft Framework by late 2012. Stakeholder consultations were held in early 2012. It is unclear when or whether a Final Framework will appear and also when or whether the above goals will be achieved. The barriers are discussed in the following section.

2.2 The Present Malaise

At least five factors appear to working against the establishment of a fit-for-purpose building energy efficiency/carbon framework that would take Australia towards the goal of zero carbon buildings within a defined timeframe. These may be summarised as:

1. A lack of political will, which in turn reflects a) Australia's weak climate change target, and b) a view that Australia's carbon pricing mechanism makes most other policy measures – and certainly building energy performance requirements – redundant;

2. A lack of a credible national energy efficiency policy, and the absence of energy efficiency targets;

3. A lack of co-operation between the Commonwealth and major States/Territories, augmented by unclear accountability for buildings policy and regulation between jurisdictions and even agencies within jurisdictions;

4. An apparent unwillingness to deal with the 'paradigm shift' that is being worked by low-cost PV, which in turn reflects short-comings in wider energy policy and regulation;

5. At a more technical level, a lack of appropriate guidelines, research and data to underpin realistic benefit cost analyses and regulatory impact assessments – the net effect of which is generally to overstate the costs and understate the benefits of building energy performance regulation.

Each of these barriers is discussed briefly below.

2.3 Climate Policy and the Carbon Pricing Mechanism

One might suppose that the potential for large and highly cost-effective greenhouse gas abatement benefits, as well as significant economic and social benefits, would be welcomed and embraced by the designers of climate policy in Australia, and responded to with much strengthened and forward-looking policy settings. The reality is somewhat different.

The Australian Government views its carbon pricing mechanism (CPM) as its primary policy instrument to achieve its climate policy goals. It is actively discouraging new policy measures and indeed seeking to prune out as many existing policy measures as possible. It justifies this view on the grounds that pricing carbon represents a 'least cost' approach to reducing emissions. Setting to one side the research that conclusively demonstrates that this is not (necessarily) so, the CPM presents two major threats to the development of a policy framework that would enable the realisation of a goal of cost-effective, zero-energy/zero-carbon buildings in Australia.

First, the carbon saving effect of what are now referred to (disparagingly) as 'complementary measures' (that is, any measure that is not the CPM) is not 'additional' to the cap mechanism under the CPM. Under a cap-and-trade scheme, it is the level of the cap that determines the volume of allowed emissions, in every year, from the sectors of the economy 'covered' by the scheme. The *Clean Energy Act 2011* prescribes a number of factors that must be taken into account when recommending to the Minister the level of future caps (the decision itself, however, is left to the Minister's discretion). These factors fail to include the abatement effect of existing (or future) 'complementary measures', even if a discretion exists for the Climate Change Authority (that advises government on the caps) to consider 'other relevant matters'.

While this may seem a technical point, it means that the very substantial abatement effect of building energy efficiency measures – and indeed of many other measures besides – counts for precisely nothing once the cap mechanism is in place (from 2015). Therefore, building energy policy – as with most other 'complementary measures – is vulnerable to the criticism

that ‘it won’t add one gram of abatement to the national effort, so why don’t we get rid of it?’. This view has been starkly put to government, and indeed to COAG, by the Productivity Commission (Productivity Commission, 2012c). Those who put this view fail to acknowledge that this ‘additionality’ problem is entirely a creation of one section of one Act of Parliament; ie, a policy failure that could readily be corrected. The fact that this is neither acknowledged, nor less acted upon (by amending the Act), may be traced back to the afore-mentioned view that carbon pricing must be the primary climate policy instrument. This view is pursued in Australia with a degree of zeal that suggests that it is based on something other than rational analysis.

However, the second threat that climate policy poses to building energy performance regulation is complacency. Australia’s official climate abatement target is to achieve a 5% reduction in 2000 emissions by 2020. Due to the slow down in the global and large parts of the domestic economy; a particular slowdown in forest harvesting due to both global and local economic factors; changes in the national energy market that largely preceded carbon pricing (and many of which are attributable to the same energy efficiency and renewable energy policy measures that are now under threat on ‘complementarity’ and ‘additionality’ grounds), and – to be fair – to some additional abatement effect from the CPM itself, there is now a view that Australia may achieve its target without further policy development...including building energy efficiency policy.

Given the climate science reviewed very briefly above, it is at least a tenable view that we have no grounds for complacency. Australia is amongst the highest per-capita greenhouse polluters in the world. The Australian Treasury’s analysis of the carbon pricing mechanism clear states an expectation that by 2050 (nearly 4 decades into the future), actual emissions in Australia will be just 2% below their level in 2000, while the difference between this any political goal (which has been set at 80% below 2000 by 2050) will be made up by purchasing offsets (Treasury, 2011). Our plan to rely on carbon trading, and to import ‘certified abatement’ rather than reduce emissions domestically through genuine structural reform and best practices, is of questionable ethical integrity, and may not even pass the purely mercantile test of ‘least cost’.

2.4 Energy Efficiency Policy

In 2009 the Australian Government established an Energy Efficiency Task Force to report directly to the Prime Minister on strategic energy efficiency policy. The Task Force duly reported in July 2010, making 44 detailed recommendations, starting with the setting of a national energy efficiency target or goal. To date, only two of the 44 recommendations have been responded to by government. First, it rejected out of hand the concept of a national energy efficiency goal or target. The justification for this may be found in the above discussion on climate policy and the role of the CPM. Second, it agreed to ‘consider’ a national energy savings initiative (conceived of as a ‘white certificates’ scheme). At the time of writing, the consideration process goes on, with only a ‘Progress Report’ having been publically released. The balance of 42 detailed recommendations to the Prime Minister remain unresponded to, either in the positive or in the negative.

2.5 Policy Governance

Building regulation has traditionally been viewed as a Constitutional responsibility of the States and Territories. Australia's Constitution – unlike many – assigns an 'exclusive' list of functions to the Commonwealth, while all functions remain with the States…at least in theory. Building regulation apparently did not rate highly in the minds of our 'founding fathers', and therefore does not rate a mention in our Constitution. On this basis, it belongs to the States. However, the Commonwealth is responsible for the regulation of corporations, and also for implementing ratified international treaties (such as the UN Framework Convention on Climate Change and Kyoto Protocol, for example). The Commonwealth has also most of the taxation powers in Australia and therefore captures the vast majority of government spending power, even if much of the revenue is 'recycled' to the states under various mechanisms.

As a result of these factors, and others besides, governance of buildings policy generally in Australia is contested and unclear. At the time of writing, political tensions and budgetary pressures are also adding to a policy 'stand-off' between jurisdictions, with building energy efficiency policy apparently one of many casualties. It is hard to judge whether, given the two factors noted previously, whether this third factor is material or not. We can, however, be sure that it is not helping.

2.6 The PV Paradigm Shift

PV technology – originally developed by NASA for use on satellites – has until very recently suffered from high capital costs. However, since around 2007, the price of panels has fallen by up to 90% (pitt&sherry 2012). This is one of the key factors – along with rising electricity prices – that is making PV on buildings increasingly cost effective.

One might again be forgiven for thinking that this development would be a cause for much rejoicing and celebration amongst policy makers, however no such levity is evident. PV is a 'disruptive technology' – one that breaks the current electricity market paradigm – itself based on remote, large-scale and generally fossil-fuel powered generation, owned by large (and, in the past, state-owned) corporations, transmitted and distributed by either state-owned or private regulated monopolies, and sold by retailers to passive consumers. The flow of energy is one way; the flow of money, the other. Energy efficiency in this system is remarkably low, while greenhouse gas emissions are very high.

PV, and other low-carbon embedded generation technologies, turns this paradigm on its head. The generation technology is low- or zero-carbon; it is owned by consumers; it is distributed not centralised; the flow of energy and money is two-way between consumers and others in the power system; and large corporations – state-owned or otherwise – have little to do…other than cope with more complex and dynamic power flows (another paper would be required to describe this in detail). Interestingly the extremely high level of electricity prices that have, as noted above, been generated in Australia, as a result of the first paradigm, is also driving consumers with increasing rapidity towards the second. A 'market response' indeed. Thus, an industry that has evolved to 'clip the ticket on the way

through', as power flowed downhill in the first paradigm, suddenly can feel its business model being undermined. Not surprisingly, the industry is pushing back, as are the governments that design the energy market, regulate the market players and often own the businesses that participate in the market.

The result that PV may make zero energy or zero carbon buildings cost effective in Australia is troubling for policy makers…not in buildings policy, and not for those interested in a clean, low carbon and sustainable future, but in energy policy and in our Treasuries.

2.7 Analytical Constraints

While a lesser and more technical issue, the lack of adequate data, statistics and funding for the development of the same, does hold back the creation of compelling 'business cases' for buildings policy *inter alia*. Further the Orwellian-named Office of Best Practice Regulation in Australia – which essentially sets the rules for quantitative and impact assessment of regulation in Australia – insists on high hurdle rates (at least 7% real) and does not prescribe that learning effects, technological change and other factors (that might improve the business case for regulation) be included in the analysis. Of course, these may be included…provided they are specified in the briefs let by the policy agencies (which is rare), and provided research has been done to enable these factors to be quantified (which is even more rare).

3. Conclusion – A 10 Point Plan

What would it take to overcome the barriers noted in this paper, and instead to realise the opportunities presented by cost-effective, zero energy/zero carbon buildings in Australia?

The answers are suggested in the above points. For economy, they are summarised in point form:

1. Australian governments should publically acknowledge that building energy performance in Australia is poor, and that this is a major drive of a) greenhouse gas emissions, b) costly and unnecessary energy consumption, c) energy system cost impacts, and d) therefore, a major driver of rising electricity prices in Australia;

2. Australian governments should publically acknowledge that there is very large potential for improving the thermal and energy performance of buildings, and that creating policy settings to capture this potential would be a highly effective and cost effective strategy for responding to point 1) above. Alternative solutions to these issues should be benchmarked against building policy and the least cost options chosen…if indeed we believe in least-cost and rational public policy;

3. Australian governments must set high, but evidence-based, standards and goals, not the low ones that have applied, and continue to apply, today. This includes with respect to climate policy, energy efficiency policy and buildings energy efficiency policy more narrowly.

4. The *Clean Energy Act 2011* must be amended to remove the policy failure that results in the 'non-additionality' of building energy efficiency policy and all other non-CPM policies and measures; the pejorative term 'complementary measures' should be consigned to the dustbin of history.

5. The governments' laudable goal of creating an integrated framework for regulation, assessment and rating of building energy performance should be put into effect as soon as possible. To the framework I would add an effective mechanism to ensure compliance with existing and future buildings regulation.

6. The Australian Government should respond without further delay, in detail and positively to the 44 recommendations of the Prime Minister's Task Force on Energy Efficiency, including by setting an ambitious national energy efficiency (not intensity) target, with a detailed, measure-by-measure, year-by-year plan for its achievement.

7. Governance arrangements for the building industry must finally and definitively be settled. The flood of powers from the states and territories to the Commonwealth suggests the direction in which this might be resolved. However, that outcome should be contingent upon the commitment of the Australian Government to put in place – and keep in place – and to fund – a credible buildings policy in Australia.

8. Governments in Australia, and their agencies responsible for energy policy, must come to grips with the PV/distributed energy paradigm shift. To date, the key response has been to worsen economic conditions for PV, in the hope that it will go away. It won't.

9. Governments in Australia, and primarily the Australian Government, must fund the creation and maintenance of adequate, fit for purpose and publically-accessible data sets, and also the conduct of public interest research on public policy matters, including building energy efficiency, on an adequate, secure, long-term and independent basis.

10. Above all, Governments in Australia should offer genuine leadership on climate policy in particular, ensuring *inter alia* that targets are based in science and not politics; that policy is based in genuine and rational analysis, sound data and not ideology; and that buildings policy in Australia receives the enhanced focus and support that it deserves.

References

AER (2011) State of the Energy Market 2011, Australian Energy Regulator, Australian Government, 2011.

CIE (2009) Consultation Regulation Impact Statement – Proposal to Revise the Energy Efficiency Requirements in the Building Code of Australia for Commercial Buildings –

Classes 3 and 5 to 9, prepared by the Centre for International Economic and published by the Australian Building Codes Board, 2009.

IEA (2011) Technology Roadmap: Energy-efficient Buildings: Heating and Cooling Equipment. OECD/IEA, 2011.

IPCC (2007) Climate Change 2007: Synthesis Report: Summary for Policymakers. Intergovernmental Panel on Climate Change, 2007.

J.E.Hansen and M.Sato (2012). *Paleoclimate Implications for Human-Made Climate Change*, James E. Hansen and Makiko Sato, NASA Goddard Institute for Space Studies and Columbia University Earth Institute, New York, 2012.

pitt&sherry (2010) The Pathway to 2020 for Low-Energy, Low-Carbon Buildings in Australia: Indicative Stringency Study, published by the Department of Climate Change and Energy Efficiency, Australian Government, 2010.

Productivity Commission (2012) Electricity Network Regulatory Frameworks – Draft Report *Volume 1*, Productivity Commission, Australian Government, October 2012.

Productivity Commission (2012b) Electricity Network Regulatory Frameworks – Draft Report *Volume 2,* Productivity Commission, Australian Government, October 2012.

Productivity Commission (2012c) COAG's Regulatory and Competition Reform Agenda: a high level assessment of the gains, Productivity Commission Research Paper, Australisan Government, June 2012.

NSEE (2009) National Strategy on Energy Efficiency, Council of Australian Governments, 2009.

RET (2011) Energy in Australia 2011. Department of Resources, Energy and Tourism, Australian Government, 2011.