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Building energy efficiency and greenhouse gas emission abatement: Potential and implications

Prepared for:

Garnaut Climate Change Review

Public forum on Transport, Planning and the Built Environment

Presented by:

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Key issues

- How much GHG emissions are attributable to the buildings sector?
- What is the potential for GHG abatement in the sector and at what cost?
- What difference would achievement of building sector savings make to achievement of deep emissions cuts across the Australian economy?
- What measures could assist realisation of the building sector's full GHG reduction potential?

The buildings sector

- Residential sector
- Commercial sector (ANZSIC division)
  - wholesale trade (F);
  - retail (G);
  - accommodation, cafes and restaurants (H);
  - communication services (J);
  - finance and insurance (K);
  - property and business services (L);
  - government administration and defence (M);
  - education (N);
  - health and community services (O);
  - cultural and recreational services (P); and
  - personal and other services (Q).

Energy use and GHG in the buildings sector

Final end use energy consumption in Australia by sector (2004-05)

	Consumption	
	PJ	*%*
Buildings sector	66	19.3
Commercial and services	234	6.8
Residential	432	12.5
Remaining sectors	2789	80.7
Agriculture	99	2.9
Mining	178	5.2
Manufacturing	1089	31.5
Transport	1354	39.2
Other	69	2.0
Total	3455	100.0

Source: ABARE (2006).

Estimated GHG emissions by end use in the buildings sector (2005)

	CO2e Mt	*Share (%)*
Buildings sector		
Commercial and services	56	10
Residential	74	13
Sub-total	130	23
Other	429	77
Total	559	100

Sources: Total and other from AGO (2007), building sector from Pears (2006 and 2007).

End Use emissions = emissions from use or demand. Includes allocation of upstream emissions using AGO *Factors and Methods Workbook* (Scope 3).

Building sector GHG emissions by conversion/point source/supply = < 5-7% of total

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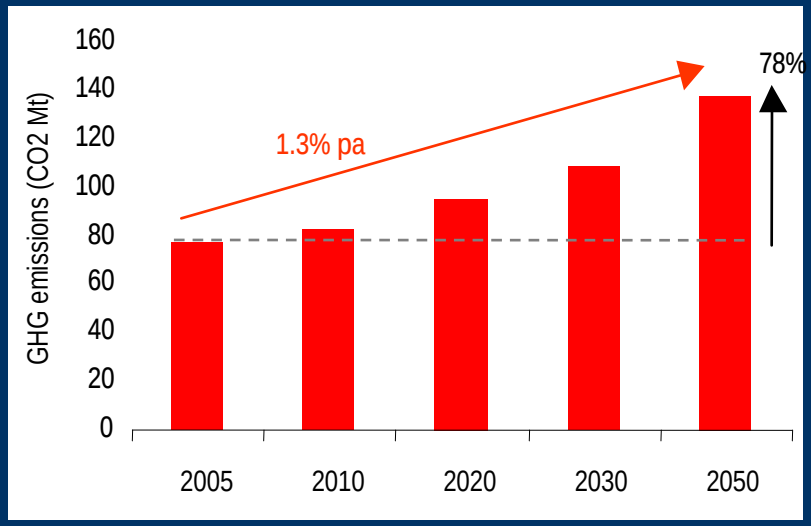
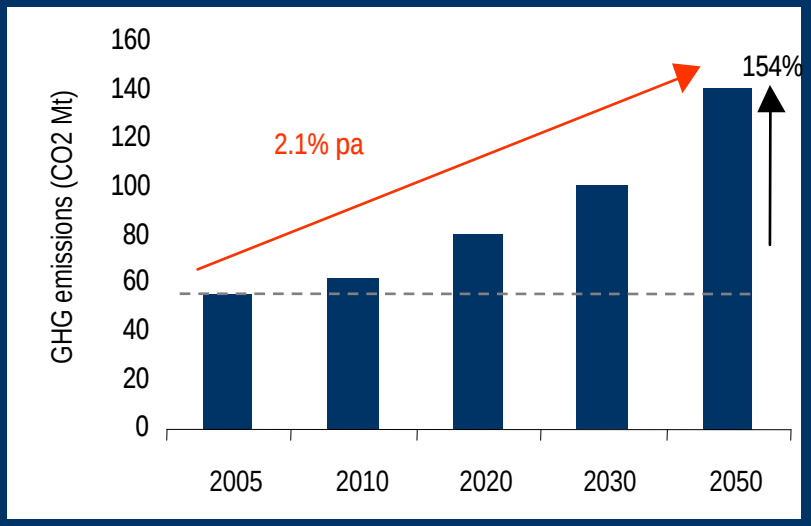
GHG Emission projections – Base case

Residential sector



Data sources: Pears (2007) and CIE.

Commercial sector



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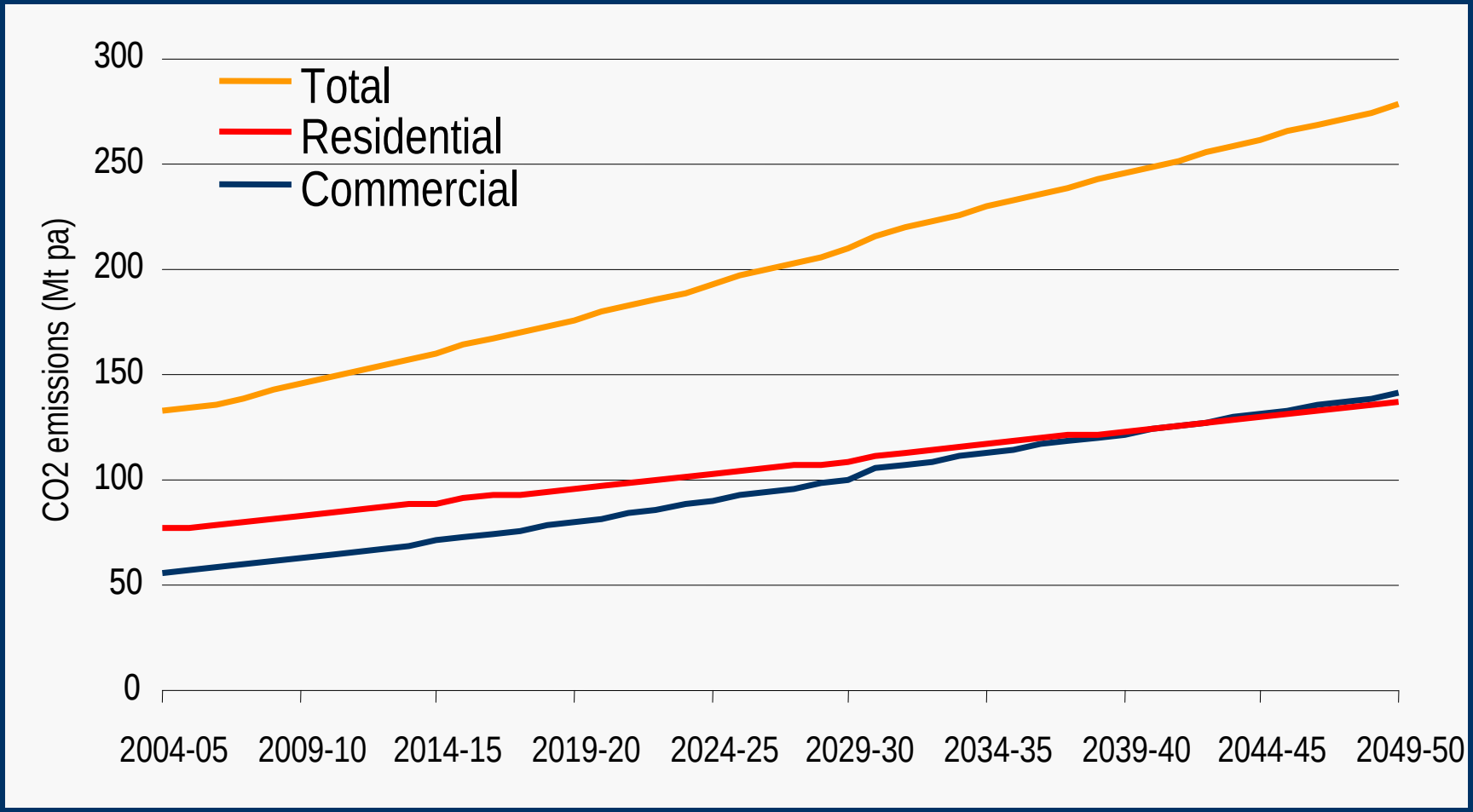
Base case building sector emissions



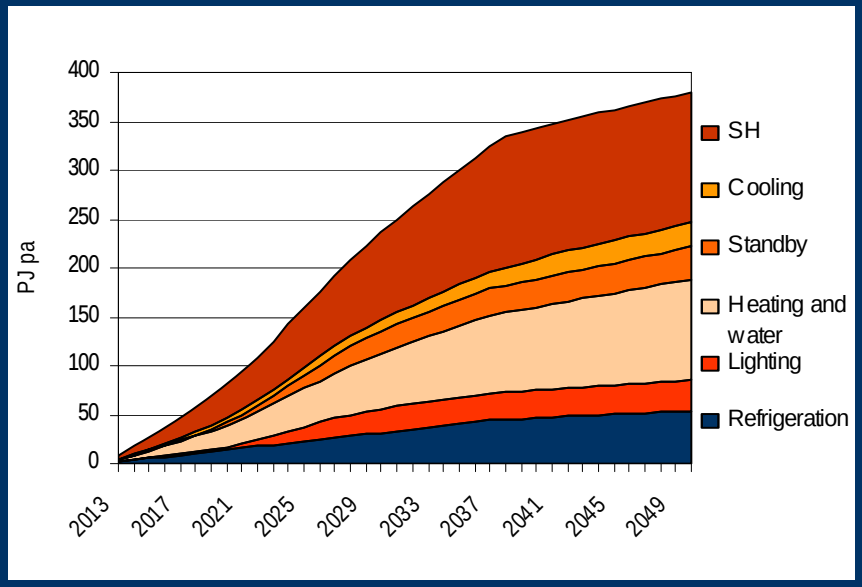
Sources: ABARE (2006) and CIE.

Energy efficiency scenario

- Households:
  - Make greater use of more energy and GHG efficient appliances and assets over time
  - Replace appliances on a like-with-like basis so that there is no change in service quality or live-ability
  - Make replacements and changes when the previous assets wear out or become redundant (so that there is no asset destruction)
- Commercial:
  - Global estimates of energy efficiency potential by energy application/service with Australian values

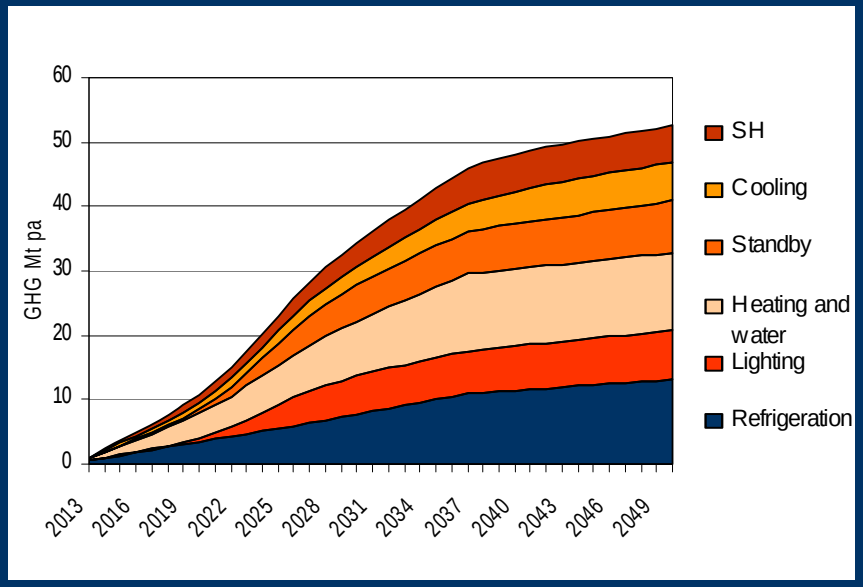
Residential energy efficiency case

Residential sector energy efficiency



Data sources: CIE and Pears 2007.

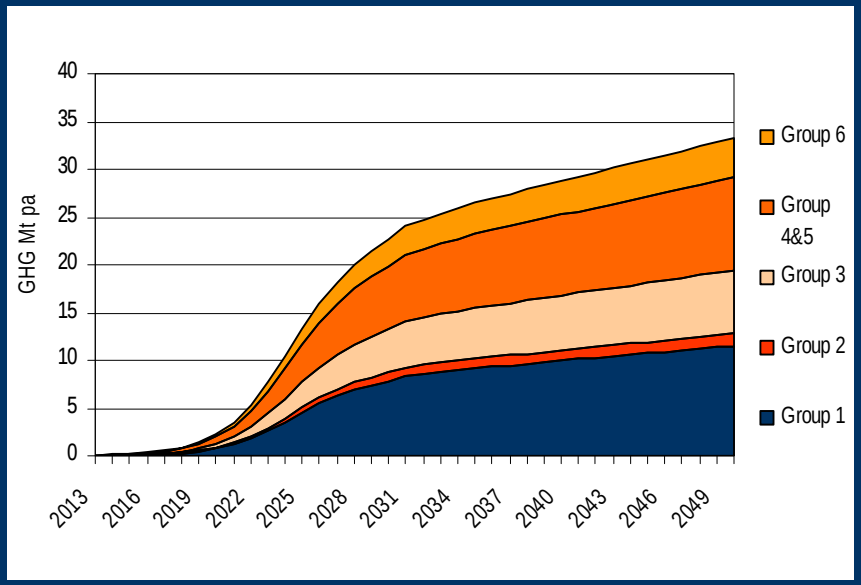
GHG abatement



Data sources: CIE and Pears 2007.

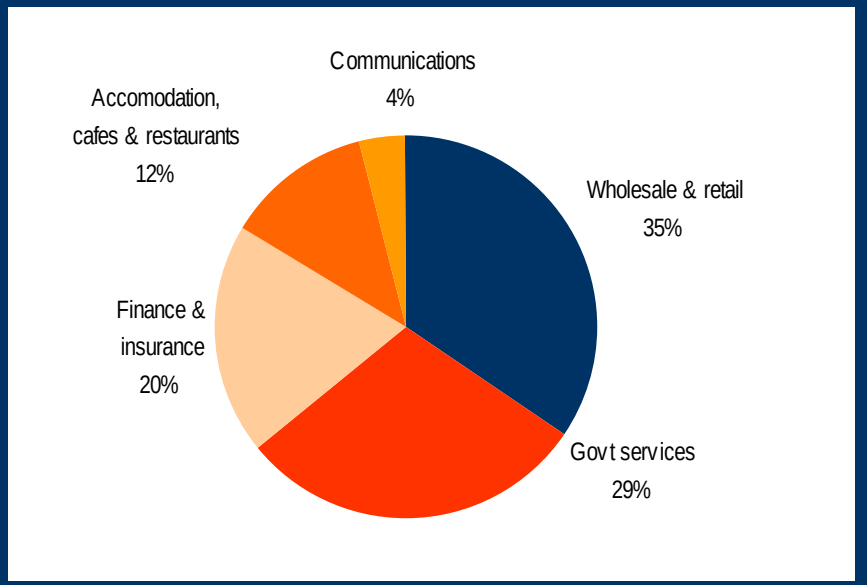
Commercial energy efficiency scenario

Abatement by sub-sector/group



Data sources: CIE, Pears (2007) and Vattenfall (2007).

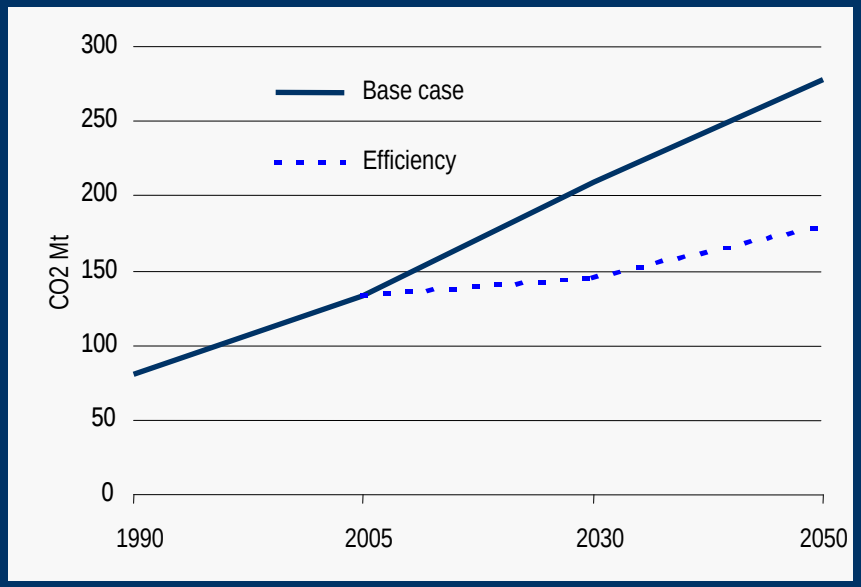
Share of GHG abatement



Data source: CIE.

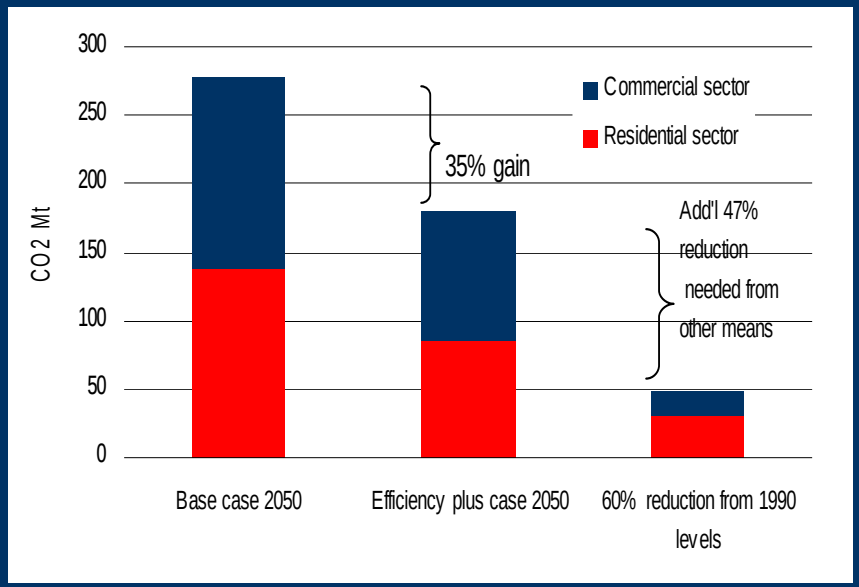
Building sector savings

Estimated change in GHG emissions from built environment



Data source: CIE.

Estimated change in emissions compared to 1990 benchmark



Data source: CIE.

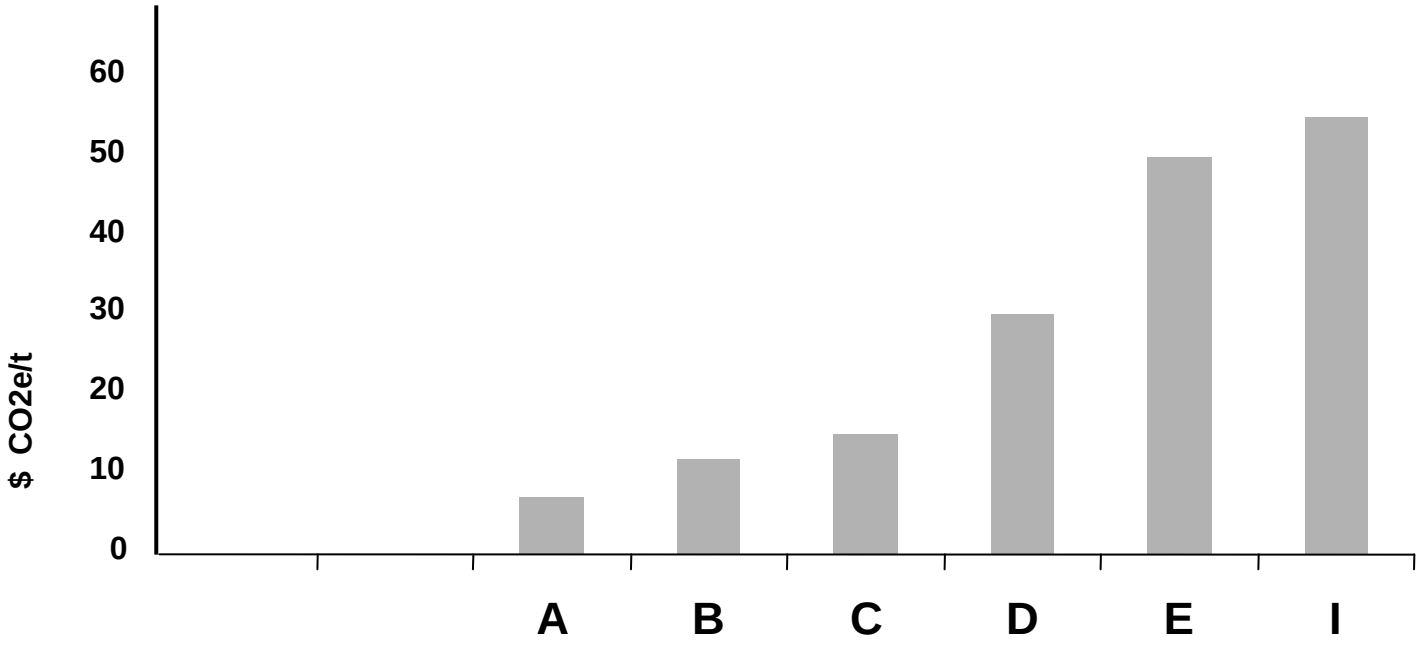
Points about potential

- Building sector can reduce demand for energy and therefore reduce GHG emissions
- Some 30-35% of building sector emissions can be reduced with a payback period and positive financial return – a net benefit rather than a cost
- Some 39-45Mt of GHG emissions could be avoided each year depending on how fast changes are made in the building sector
- Delay locks in future emissions in the fabric of buildings and consumption patterns

What difference could this make?

- Is the building sector's potential large enough to make a difference to the national economic cost of combating climate change?
- The analysis looks at *deep cuts* – 60% of 2000 emissions by 2050
- It also examines *deep cuts plus* – achieving the deep cuts with the addition of demand side measures in the building sector
- To be conservative building sector GHG savings are modeled as being cost neutral (discounting economic gains from this source)

Stylised industry abatement



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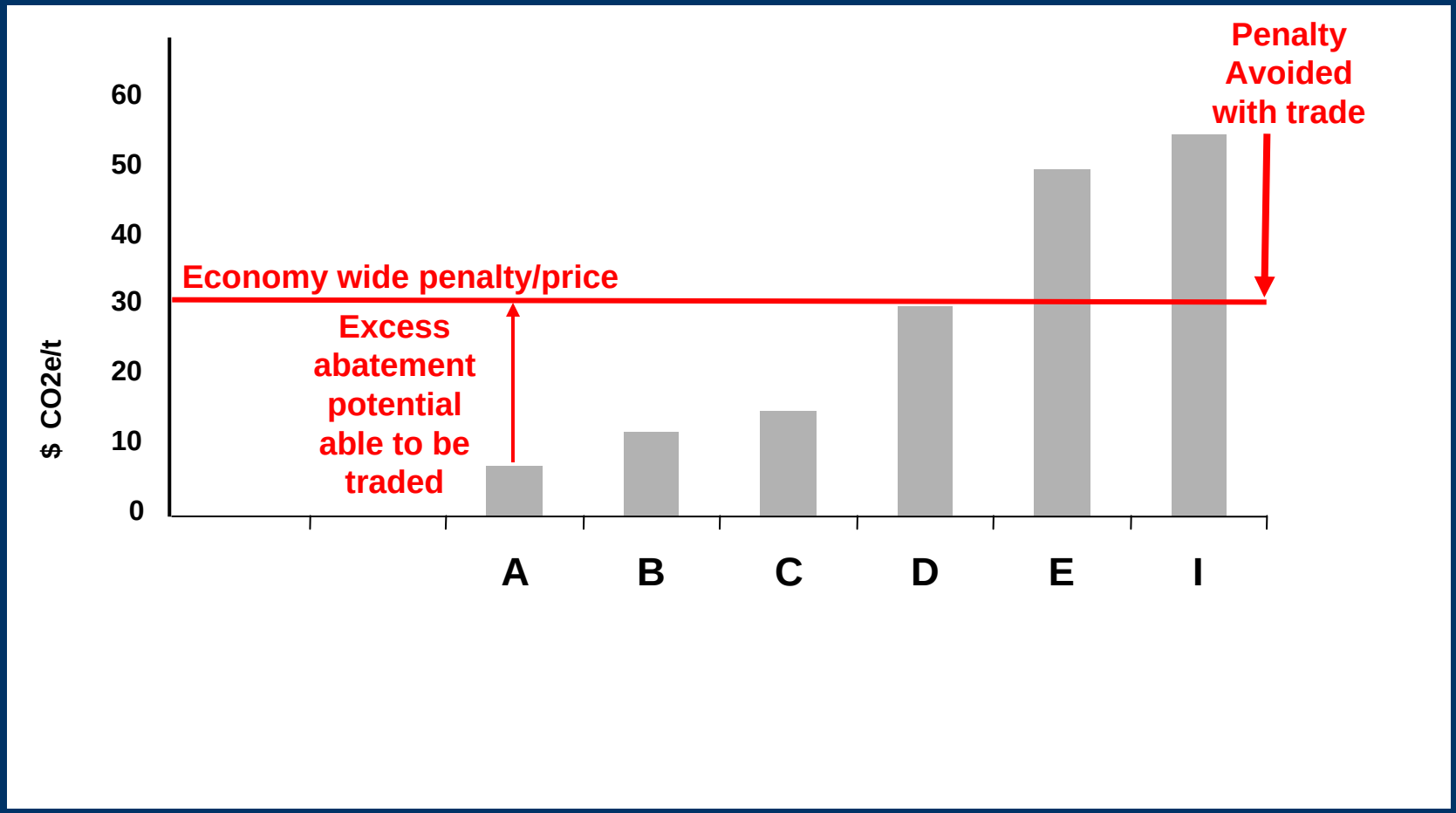
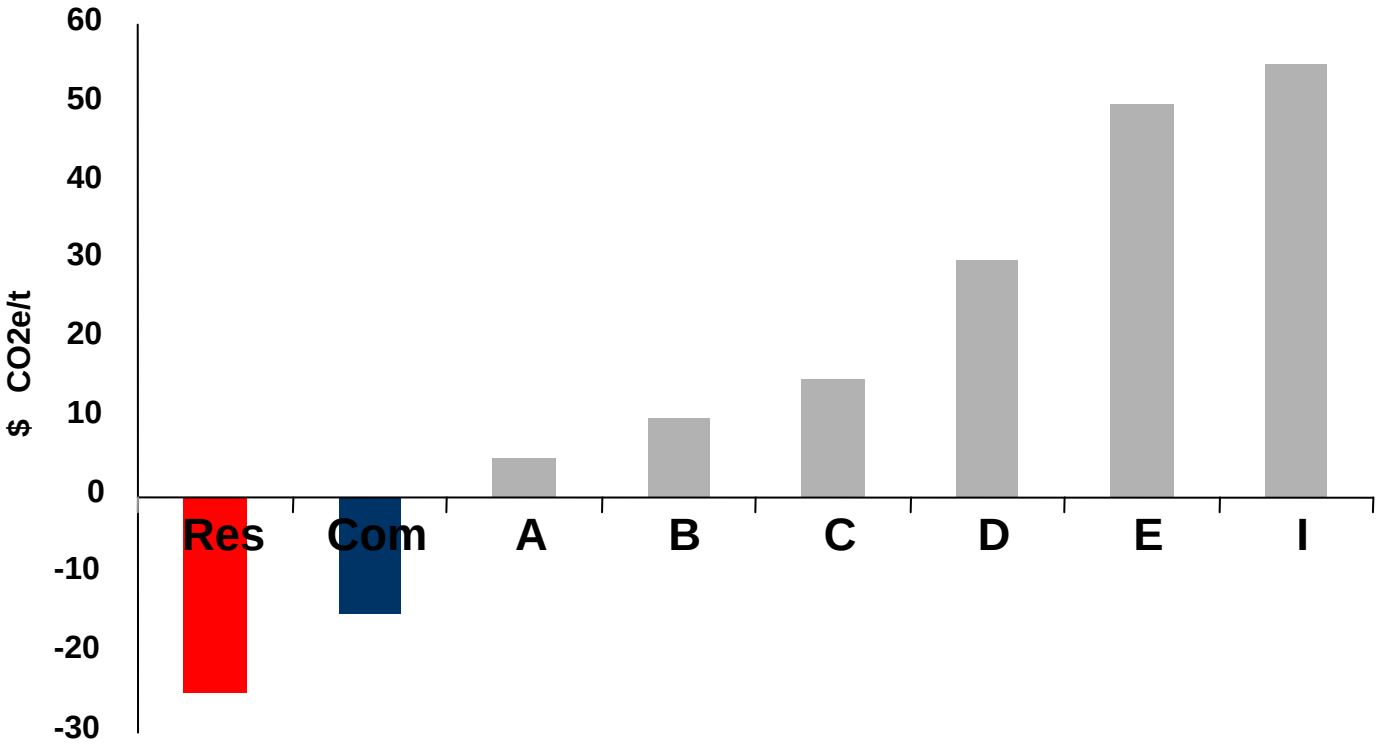


Add building sector GHG reduction



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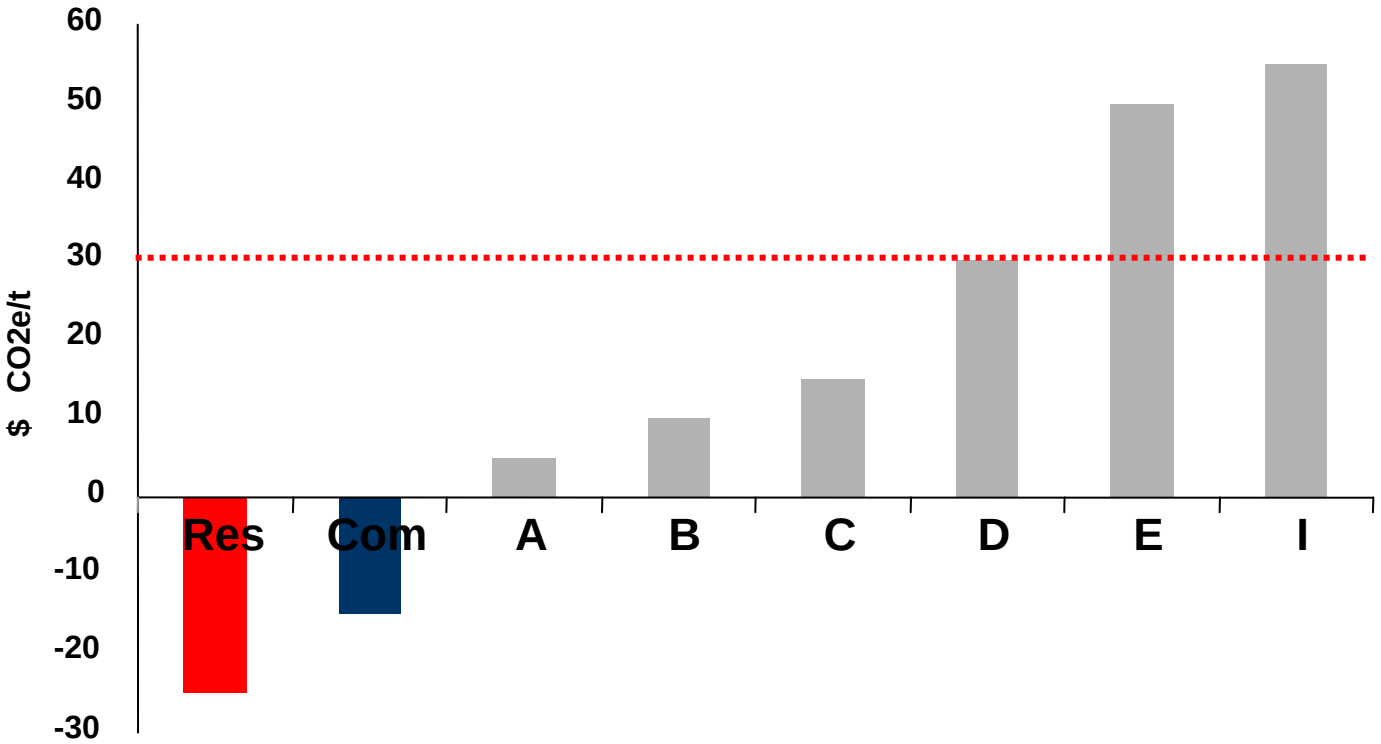

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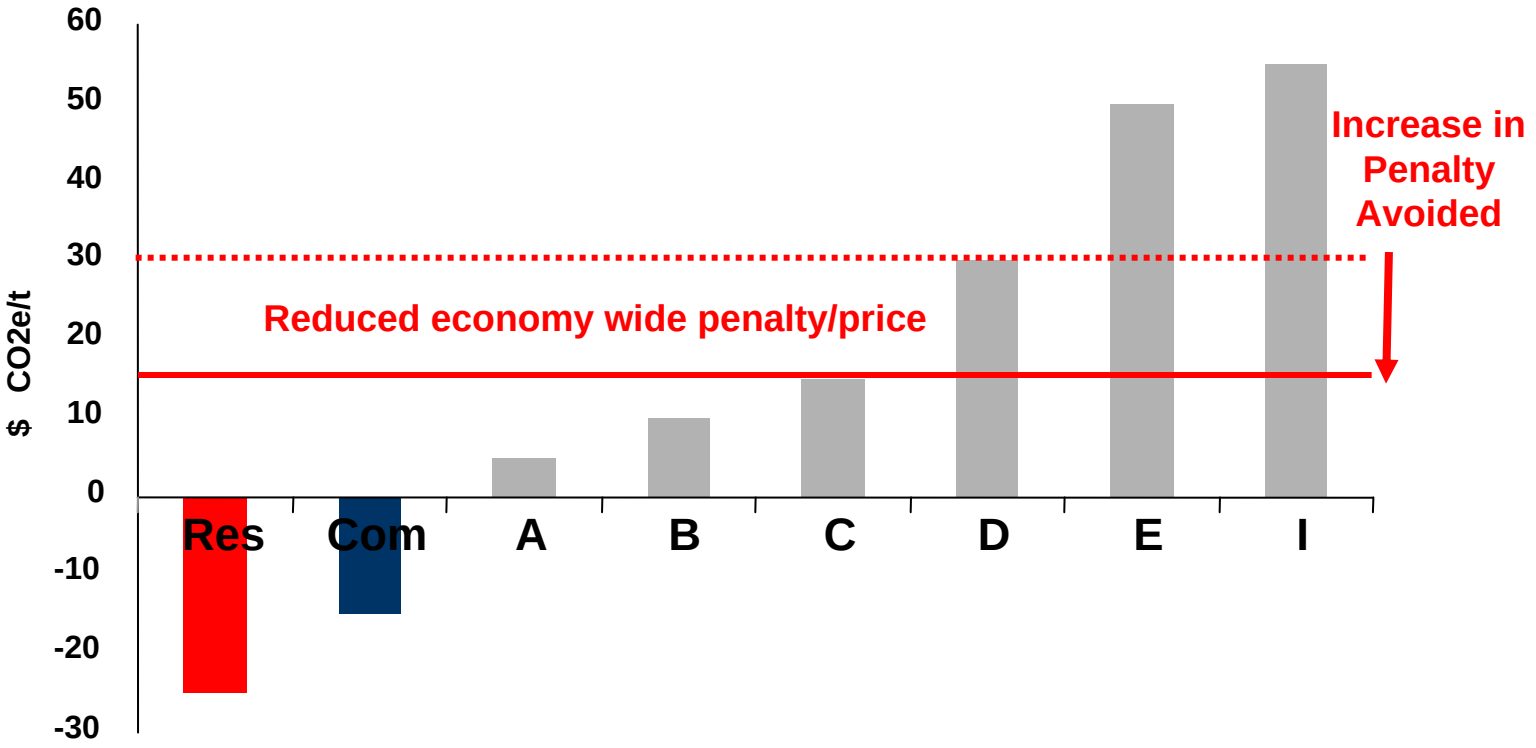
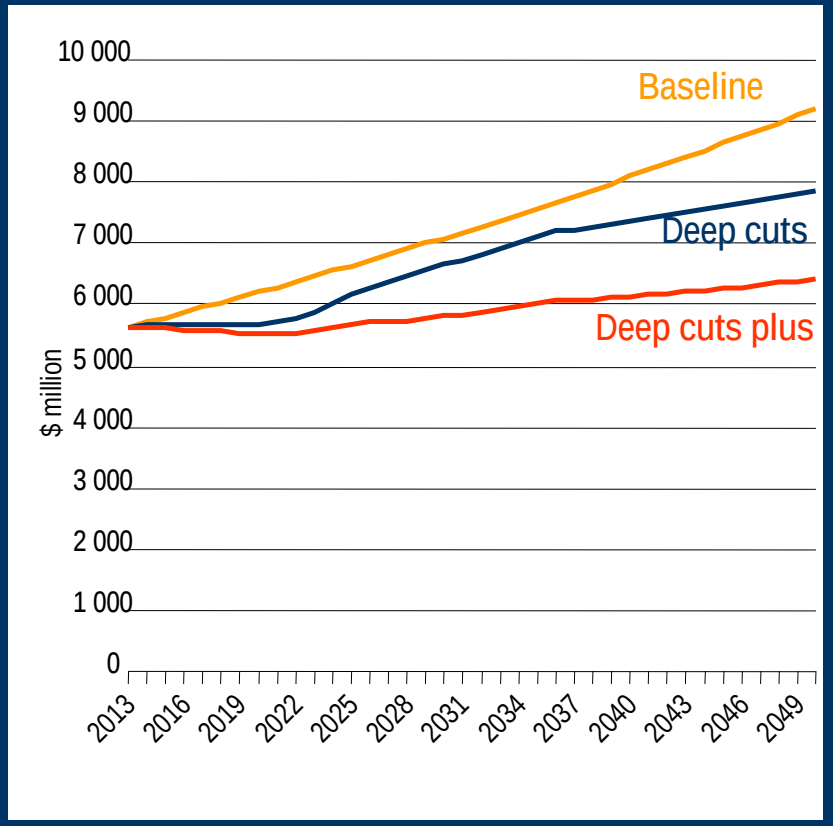


Changes in energy demand

- Energy efficiency in the building sector reduces demand for electricity generation
  - *Deep cuts* reduces energy demand
  - *Deep cuts plus* enables even more savings in energy

Annual real value added for electricity generation: 3 scenarios[a]

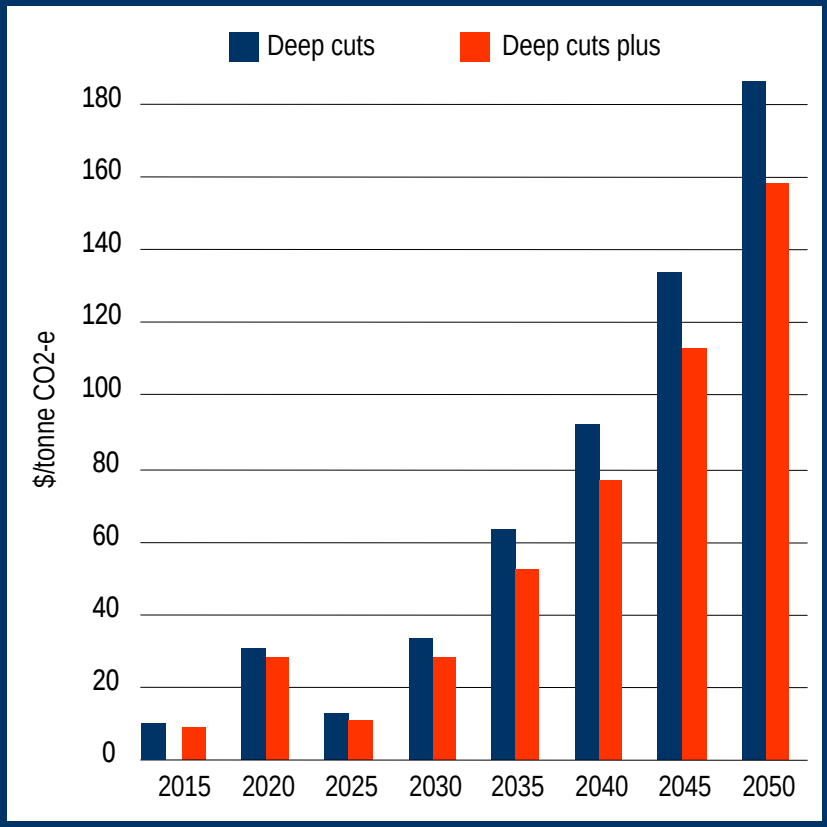


[a] 2005 prices.
Data source: MMRF-Green simulation results.

Changes in the economy wide emissions penalty

- Penalty for GHG emissions is $190/t with deep emission cuts by 2050
- With building sector energy efficiency (deep cuts plus) the cost would be $160/t
- Building sector energy efficiency reduces the cost of GHG abatement for everyone (a projected reduction of around 16%)

Implied cost of GHG abatement — selected years[a]



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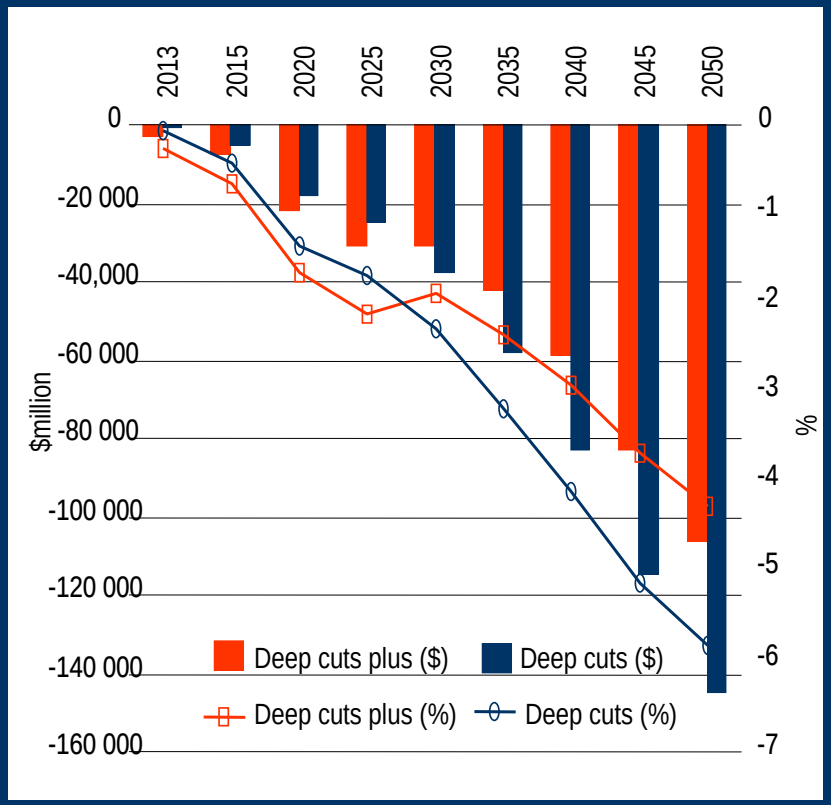
Data source: MMRF-Green simulation results.

Changes in the economy wide cost of abatement

- Additional energy efficiency in the building sector is projected to reduce the cost of abatement from 6-7% of GDP to 4-5% by 2050
- There is an improvement in in GDP of around $38 billion per annum by 2050 if greater energy efficiency in the building sector is factored in
- Stern (2007) estimates the benefits of avoiding climate change to be worth 5-20% of global GDP

Deviation from baseline annual GDP: selected years[a]



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Potential measures and buildings

Emissions Trading Scheme	Permit liability imposed on direct emissions from large facilities excludes building sector. Permit liability imposed upstream using supplied fuel as a proxy = carbon tax without scope for trade of surplus abatement potential
Awareness/education/information	Effectiveness limited – does not address all barriers to change
Standards	Works best for new buildings (1% of building stock each year)
Grants	Limited effect – likely to be small compared to large number of buildings
Green Depreciation	Rapid alteration of existing stock at the cost of a delay in a large amount of tax revenue
White Certificates/ extension of GGAS/ Energy efficiency certificates	Moderate transaction costs for large reduction in demand – is uniform carbon price on supply and demand sides needed?

Conclusions

- The buildings sector contributes to energy demand that drives 23 per cent of Australia's GHG emissions
- The buildings sector can make a significant contribution to GHG abatement – a reduction of some 39-45Mt pa – at low cost (or net gain)
- Obtaining a contribution from the building sector is vital to enable deep cuts at the lowest cost to the economy at large
- Further thinking is needed about policy measures to monetize potential that is complementary to Emissions Trading

Sources and references

This presentation draws on detailed reports and presentations the CIE has prepared for the Australian Sustainable Built Environment Council (ASBEC) is the peak body of key organisations committed to a sustainable built environment in Australia.

ASBEC members consists of industry and professional associations, non-government organisations and government observers who are involved in the planning, design, delivery and operation of our built environment, and are concerned with the social and environmental impacts of this sector.

Down load the summary report from http://www.asbec.asn.au/files/Building-sector-potential_Sept13.pdf

CIE source documents follow:

CIE (Centre for International Economics) 2007a, Deep emission cuts in the Buildings Sector Module A: Emission abatement assumptions and framework, Briefing prepared for the ASBEC Climate Change Sub-committee, June.

— 2007b, Module A: cost abatement curve for energy efficiency in the building environment, Discussion paper prepared for the ASBEC Climate Change Sub-committee, July.

— 2007c, Economy-wide implications of deep GHG emission cuts by the building sector – Preliminary key findings for Module B, Briefing prepared for the ASBEC Climate Change Sub-committee, August.

— 2007d, Capitalising on the building sector's potential to lessen the costs of a broad based GHG emissions cut, Report prepared for the ASBEC Climate Change Sub-committee, September.