The buildings sector and greenhouse: key facts

- **The buildings sector accounts for 130 Million tonnes (Mt) of greenhouse gas emissions each year.**
- **This is around 23 per cent of Australia's emissions reported in the most recent inventory prepared by the Government for 2005.**
- **Buildings sector greenhouse gas emissions are projected to grow to 280 Mt by 2050 an increase of 110% on 2005 emissions.**
- **Research indicates, that through the use of demand side abatement strategies, 30-35% of buildings sector greenhouse gas emissions could be eliminated on a cost effective basis by 2050.**
- **The buildings sector could play a major role in reducing the cost of abatement for the economy at large within the Government's strategy to combat emissions especially in the context of an emissions trading scheme, with research showing an annual saving of $38 billion in the very long run.**
- **There are barriers to achievement of significant greenhouse gas abatement in the buildings sector and supportive policy measures involving stronger incentives are needed.**

The buildings sector

The buildings sector is comprised of buildings in the residential and commercial sectors. Residential buildings include all stand alone houses and attached dwellings (such as apartment complexes and townhouses). Commercial buildings include those buildings that are primarily occupied with or engaged in commercial services, as well as buildings that house the delivery of community services (such as education and healthcare).

The buildings sector houses 100 per cent of Australia's population and through activities including retail trade, accommodation, business services, government and government agencies, recreation and cultural services and industry, it houses around two thirds of national employment.

The buildings sector

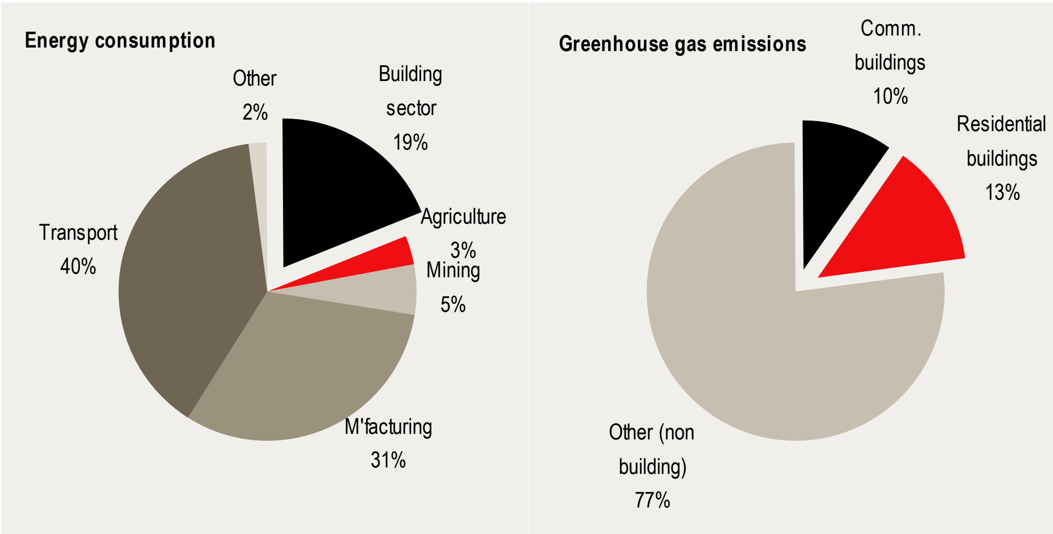
RESDIENTIAL BUILDINGS	COMMERCIAL BUILDINGS
Detached houses	Wholesale trade
Attached dwellings	Retail
Buildings containing two or more sole occupancy units	Accommodation, cafes and restraints
	Communication services
	Finance and insurance
	Property and business services
	Government administration and defence
	Education
	Health and community services
	Cultural and recreational services
	Personal and other services

Data source: CIE 2007

Energy use and greenhouse gas emissions

Buildings account for nearly a fifth of Australia's final end use energy consumption, and are responsible for 23 per cent Australia's greenhouse gas emissions. This is almost the same amount greenhouse gas emissions as is produced by the entire transport sector. The buildings sector's contribution to greenhouse gas emissions is mainly driven by its end use or, or demand for, electricity.

Energy consumption and greenhouse gas emissions

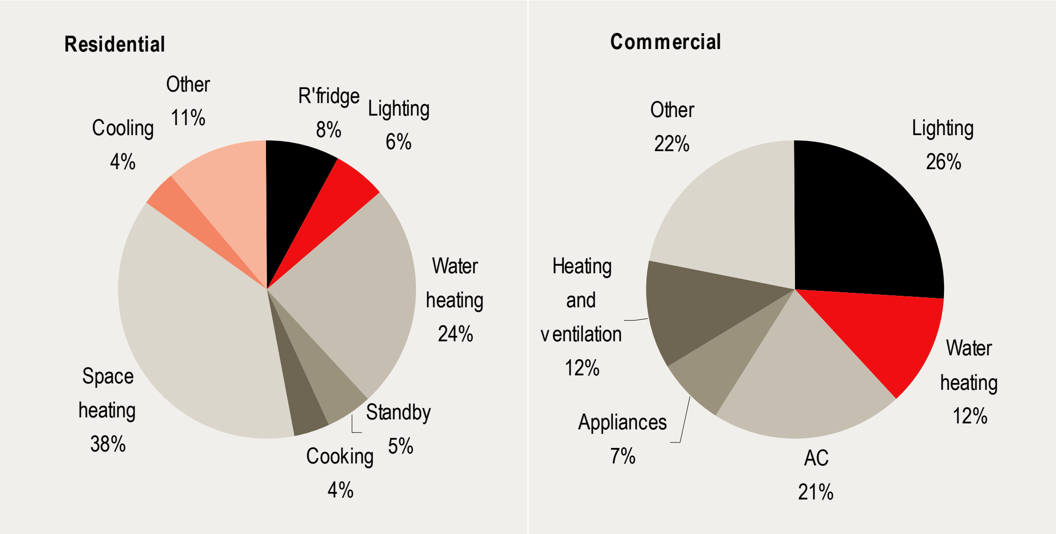


Data source: CIE 2007

Residential and commercial buildings use energy for different purposes. Nearly two thirds of residential energy use is for heating or cooling (including water heating) compared to only a quarter in commercial buildings.

There is little hard information about energy use in all commercial buildings, but is estimated that more than a quarter of commercial energy is for lighting, where as lighting in residential buildings accounts for only 6 per cent.

Energy use in buildings



Data source: CIE 2007

Emissions growth

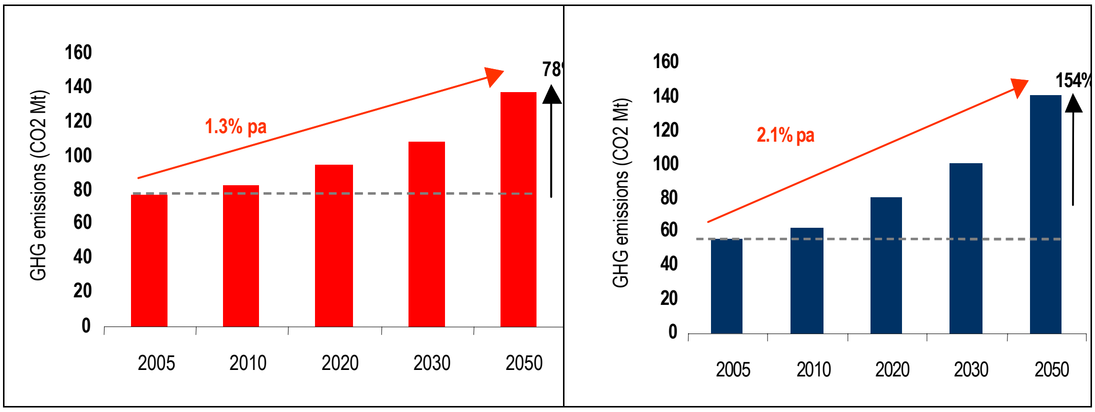
Buildings sector greenhouse gas emissions are projected to grow from 130 Mt pa in 2005 to 210 Mt by 2030 based on official government energy end use projections (ABARE 2006a).

They are then projected to grow to 280 Mt by 2050 (CIE 2007).

The commercial sector emissions are expected to grow at a faster pace than residential sector emissions.

Buildings sector emission projections

Residential sector **Commercial sector emissions**



Source: CIE 2007

Demand side abatement strategies

Much attention is focused on the creation and abatement of greenhouse gasses when energy is produced or fuel is burnt. This is a point source emission or supply side perspective. The demand side focuses upon energy use, reducing the need for energy and raising efficiency in use and it emissions.

When comparing greenhouse gas emissions from energy demand with those from energy supply, especially point source emissions, it is important to factor in emissions involved in the whole energy supply chain in energy production, conversion or generation, transmission and distribution. An official approach for calculating total emissions for purchased electricity from the grid (the main source of electricity use in the buildings sector) is noted below.

Total emissions	**=**	**point source emissions (combustion)**	**+**	**indirect emissions (transmission and distribution loses)**
1.068 kg CO2e/kWhr		0.890 kg CO2e/kWhr		0.176 kg CO2e/kWhr

Source: Australian Greenhouse Office 2006, using data for energy consumption in New South Wales

Greenhouse gas accounting for the buildings sector has used the above approach (taking into account the full fuel cycle emissions). Clear accounting eliminates the possibility of double counting savings or other potential problems.

The key point that emerges from analysis of energy use options in the buildings sector is that there is a proportion of energy demand for which it is less expense to reduce demand or raise efficiency than it is to change the way that energy is produced or distributed (LINK D).

Reducing greenhouse gas emissions

The buildings sector could reduce its GHG emissions by 30-35% by 2050 on an economic basis. Economic in this context means that the initial costs would be offset and in some cases more than offset by cost savings from avoided energy costs over time.

The potential for increased energy efficiency in the buildings sector has been estimated through a bottom up analysis to identify energy efficiency opportunities in the buildings sector. This analysis:

- examined like-with-like replacement of energy inefficient appliances and building services with more energy efficient equivalents
- focused on *existing* technologies
- took into account the costs of change and the expected benefits from reduced energy costs
- factored in expected population growth and sustained economic growth which tends to put pressure for increased energy use.

The analysis estimates that the buildings sector could deliver this reduction in greenhouse gas emissions at a *negative cost*. That is, for each tonne of CO_2-e abated by the buildings sector, the economy could *save* as much as $133 through increased energy efficiency in residential buildings; and $140 per tonne in commercial buildings.

Decreasing greenhouse gas emissions through the buildings sector makes use of *demand side abatement strategies* to increase energy efficiency. In the residential sector changes can be achieved through:

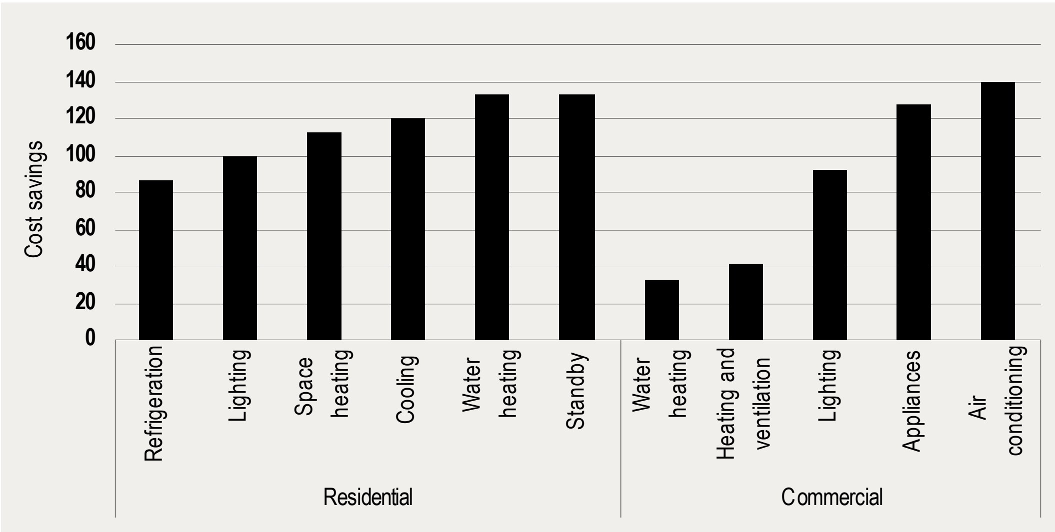
- substitution towards energy efficient light fittings;
- substitution towards more efficient refrigeration;
- adoption of more efficient hot water appliances;
- adoption of appliances with a low standby energy use; and
- the introduction of more efficient heating and cooling.

In commercial buildings substantial savings to both costs and greenhouse gas emissions could be generated by:

- improving air conditioning systems;
- the use of more efficient office appliances;
- better insulation and improved heating and ventilation;
- the use of efficient light fixtures; and
- upgrading to more efficient water heating systems.

The situation of the buildings sector contrasts with other emitting sectors. The average cost of reducing CO2-e by the power sector for instance, has been estimated at $55 a tonne. Similarly, reducing emissions produced in the forestry sector attracts a cost of $40 a tonne (McKinsey & Company, 2008).

Estimated technical cost savings from increased energy efficiency in the buildings sector, per tonne of CO2-e abated



Note: Cost savings only technical costs only: that is, these estimates only include the costs of capital and energy savings. Other costs, such as administrative costs, enforcement costs, the costs of implementation and compliance are not included in the analysis.

Data source: CIE 2007

Strategic significance

Economy wide modelling conducted by the CIE and the Centre of Policy Studies shows that including the buildings sector in the GHG abatement strategy to achieve 'deep cuts' (60% reduction on 2000 emissions by 2050) would:

- reduce the penalty price of each tonne of GHG emissions by nearly 14 per cent;
- reduce the forecast loss in economic activity required to reduce emissions – amounting to a reduction in costs with a value of $38 billion each year by 2050.
- lower adverse impacts on employment, halving the predicted job losses that would otherwise be involved in meeting the deep emission cuts.

The overall point is that taping into the lower cost GHG emission abatement potential in the buildings sector reduces the costs of meeting deep cuts in GHG emissions. It can do this through making the cost of abatement lower for everyone in the system, not just the buildings sector.

Barriers to change

There are significant barriers to the widespread adoption of greater energy efficiency in the buildings sector. Key factors include the following.

Imperfect information — people don't know about the consequences of their energy use and how to change. Even if building users and tenants wanted to raise energy efficiency or to select an energy efficient building ahead of less efficient buildings they face problems in knowing less about the performance of a building than the owners or the designers.

Split incentives — typically building owners face the costs of raising energy efficiency while the users/tenants obtain the benefits in terms of lower energy costs.

Externalities — greenhouse gas emissions are external to transactions, they are unpriced and measures to reduce them are generally unrewarded without some additional policy intervention.

Behavioural norms — much energy use is aligned with daily habits and ordinary expectations, businesses often invest more time in growing their business rather than investing in making a saving over what is for many a relatively small expense item.

An effective policy framework is required to overcome these and other barriers and promote investment in energy efficiency.

Much energy use in buildings is shaped fundamentally by the design and function of a building. It is embedded in the fabric. Naturally new buildings provide an opportunity to bring about greater efficiency. Unfortunately, buildings have a long useful life and new buildings account for about 1 per cent of the total stock in any given year. Significant change will require reinvestment in the existing stock.

Further reading and sources

ABARE (Australian Bureau of Agricultural and Resource Economics) 2006a, *Australian energy national and state projections 2029–30,* ABARE research report 06.26, December, Canberra.

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Levine, M. et al 2007, "Residential and commercial buildings" in *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, B Metz, OR Davidson, PR Bosh, R Dave, LA Meyers (eds), Cambridge Press, Cambridge and New York.

McKinsey & Company, 2008, *An Australian Cost Curve for Greenhouse Gas Reduction*.