Opportunities for existing buildings

Deep Emission Cuts

This Info Data report is the third in a series of Davis Langdon's insights into Sustainability. We investigate the opportunities associated with achieving national emission targets via the property sector.

Innovative thinking | DAVIS LANGDON

Executive Summary

23% of Australia's total greenhouse gas emissions are a result of energy demand in the building sector.[§]

This paper investigates the opportunity, costs and benefits of making deeper cuts than the minimum of 25% of greenhouse gas (GHG) emissions by 2020 (as required in the Bali Road Map) in the built environment.

The principal findings from the study are:

- Existing commercial buildings will have to be upgraded to achieve an Australian Building Greenhouse Rating (ABGR) of 4.5 Star minimum in order to achieve 40% reductions in GHG emissions.
- Emissions trading alone will not be sufficient enough incentive for the majority of property owners to upgrade their existing building's performance to achieve an ABGR 4.5 Star rating.
- Some form of capital injection or benefit (ie accelerated depreciation) will be required in order for a majority of existing building owners to be motivated.
- The potential level of incentives required to drive the 40% deep cut scenario, based on a model 20,000m^2 B Grade building, range upward from $2.6m (NPV) depending on required internal rate of return (IRR). If extrapolated to all commercial buildings in Australia, incentives of around $4b would be required over 12 years in the form of cash injections or benefits (eg accelerated depreciation).
- The upgrading of existing buildings to achieve ABGR 4.5 Star will provide some positive long term advantages for the building owners and tenants including: reduced energy costs, reduced impact of future emissions trading, reduced emissions, reduced obsolescence, provision of prudent risk management, a more competitive building which enhances building tenant appeal, improved capital value and increased rental growth.
- Given the shared benefit in upgrading our existing buildings, the industry will need to debate the extent and nature of incentives to agree on appropriate drivers for change.

Existing Office Stock

Introduction

The building sector is responsible for a large proportion of Australia's GHG emissions and can make a major contribution to meeting deep cut targets, economy-wide.

A study by the Centre for International Economics (CIE) revealed that investment in the energy efficiency of our existing built environment has the potential to reduce national GHG emissions by 30 to 35 per cent within two decades; faster and more economically than alternative approaches.

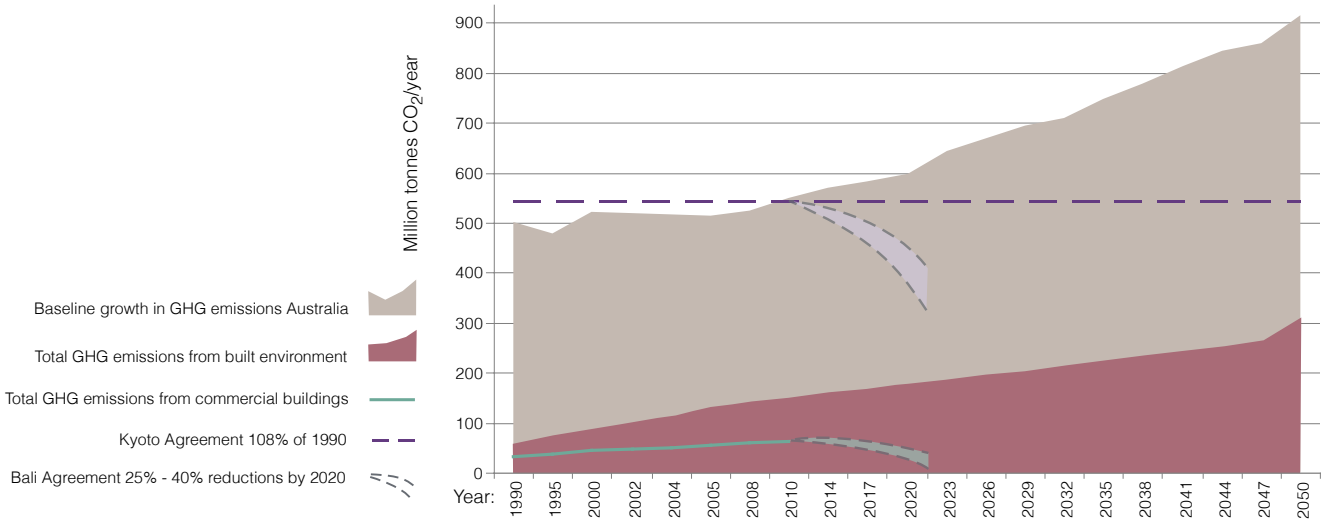
During December 2007, the United Nations Climate Change Conference in Bali resulted in a new global warming pact, agreed to by Australia, with the Federal Government committing to cut greenhouse gas emissions by 25 to 40 per cent by 2020.

Existing buildings are a fast track way to address this problem, particularly from an energy consumption perspective.

Emission projections

Of Australia's 130 million square metres of existing commercial buildings, office stock in our core commercial centres exceeds 20.5 million square metres contributing approximately 6.6 million tonnes of greenhouse gas to the environment every year.

Business as usual – baseline growth in GHG emission



The challenge for existing buildings

*"Smaller buildings are not very energy efficient, but nor are very large ones" **

Emissions in the built environment are largely driven by demand for gas and electricity over a building's lifetime, positioning our existing building stock as an ideal target for obtaining deep cuts.

As office buildings increase in age they become less efficient, using higher amounts of energy and consequently higher CO_2 emissions.

With the exception of tiger economy cities like Dubai or Shanghai, the average age of office stock in the world's major cities is becoming increasingly older. 85 per cent of all Australian office stock is older than 10 years.

The average age of Australia's office stock exceeds 27 years and the average age of Melbourne's existing office stock is 31 years#, the worst in the nation and creating an estimated 1.6 million tonnes of CO_2 per year.

However, so much energy has gone into the construction of the existing buildings (embodied energy) it is generally counterproductive, from an environmental and energy reduction perspective, to demolish them irrespective of the potential energy efficiency of a replacement building. It would take around 290 years to regain the embodied energy in a new building through its more efficient performance.

The more practical solution is therefore to upgrade existing office stock to become more efficient.

There is no 'one size fits all' solution either. Research conducted by the Royal Institution of Chartered Surveyors (RICS) in Melbourne revealed that building efficiency does not even adhere to an economy of scale: "Smaller buildings are not very energy efficient, but nor are very large buildings." *

While the challenge of existing buildings is complex, the energy efficiency potential of the building sector, particularly existing buildings, displays one of the greatest areas of opportunity for GHG deep cuts and a potential easy target for government.

Emissions reduction/trends

The built environment will have a significant role to play in obtaining the deep cuts to greenhouse gases for Australia, whatever emissions trading system Australia adopts.

From a commercial perspective, refurbishment of ageing office stock will become more attractive should an emissions trading scheme or tax be introduced – particularly the financial implications such a scheme could have for inefficient buildings.

Discussions on the table at present include the Property Council of Australia's proposed tradeable energy efficiency certificates. These would effectively form a tradeable right, rewarding property owners that improve building energy efficiency and assisting energy companies to meet their emissions caps. It would penalise buildings that fail to become more energy efficient – an impost that will adversely add to progressive obsolescence of buildings through changing tenant requirements.

Equally important for a building owner is the trend for tenants to demand more environmentally friendly building performance. This will undoubtedly continue and accelerate such that older, inefficient buildings will become socially unacceptable and more difficult to lease.

In order to meet the intention of built environment emission reductions, a tenant's fit-out within an ABGR rated building must conform to a **'Green Lease'** whereby the overall building energy consumption is not impeded as a result of tenant alterations.

Government incentives

Both state and local governments are starting to provide innovative incentives.

Brisbane City Council endorsed a new policy in March 2007, with a goal to becoming a global leader in driving sustainability in the built environment. Its policy reaches across the Council's own buildings and infrastructure, regulates minimum standards and compliance, and delivers advocacy through partnerships, education, behavioural change and incentives.

Melbourne City Council has developed The Greenhouse Action Plan 2006-2010, which sets goals for reducing greenhouse gas emissions in the municipality. The Council's target is to reach zero net emissions by 2020.

The **NSW Government** GHG Abatement Scheme (GGAS) was established in 2003 and currently operates as a benchmark and trade system – the first operational white certificates scheme in the world. Each benchmark participant is required to meet year-on-year individual targets of GHG emissions that become progressively tighter. Organisations with a less harmful impact on the environment may be awarded NSW Greenhouse Abatement Certificates (NGACs), which are tradeable to organisations that do not meet their annual emissions reduction targets.

Incentives, such as green depreciation, property tax rebates and fast track development assessment are being recommended, having been successfully implemented in other countries.

What is happening in other parts of the world?

Australia will invariably adopt an emissions trading scheme or tax similar to existing systems used in other parts of the world.

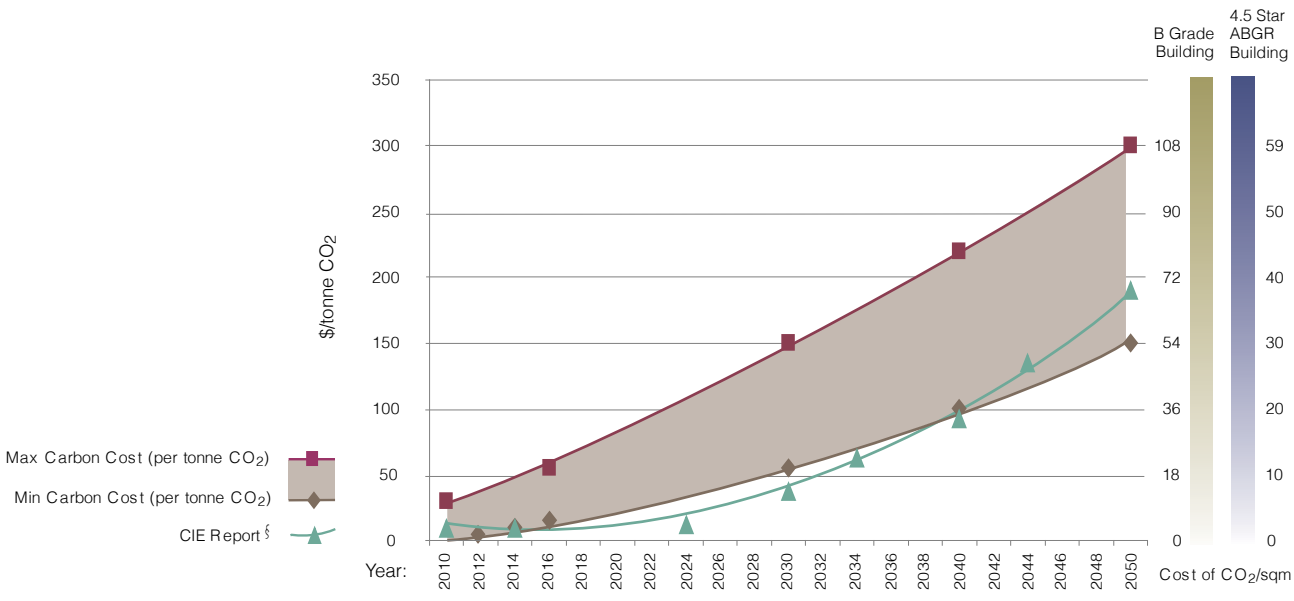
The **European Union** has adopted a cap and trade emissions market whereby each government allocates a limited number of permits which are each equal to one tonne of CO_2. This form of allowance trading relies on individual governments to place a cap on the overall emissions produced within their country – releasing a finite number of permits to each sector which is below the Kyoto targets to encourage reduced demand and alternative sources of energy production.

Organisations that have surplus permits are free to trade them internationally on the **European Climate Exchange (ECX)**. The price of each permit (tonne of CO_2) is determined by an open spot and derivatives market exchange driven by the supply and demand of permits. Fluctuations in annual energy consumption, generally as a result of the energy burden from extreme seasonal weather conditions, can markedly impact on permit demand and price. If an operator does not hold sufficient allowances at the annual compliance date then it is subject to a penalty of €100 (AU$168) per excess tonne of CO_2.

The Chicago Climate Exchange (CCX) is a voluntary benchmark and trade emissions system, with currently more than 350 members throughout North America and Brazil. This system encourages alternative sources of energy and carbon sequestration through allocation of credits that can be traded to heavy emitters.

Countries throughout the world have been proposing carbon taxes since the early 1990s, however only a few have adopted them. Carbon taxes have significant benefits over trading schemes, delivering governments a revenue stream that can be reinvested in alternative energy or energy reduction schemes. Carbon tax also extends beyond electricity generation and consumption, unlike carbon trading, to include goods or services that rely on fossil fuels. The current price of carbon taxes throughout the world ranges from AUD$10 – AUD$168 per tonne of CO_2. However concessions can exist for certain specialty industries where the increased cost of energy production is passed onto the end user.

Projected cost of carbon in Australia



Projected estimates of the cost of carbon vary depending on the timely introduction of renewable energy sources and reduced demand for fossil fuel generated energy. Any delays now in response to climate change will result in higher costs in the future.

Lines are calculated based on smoothed average.

Source: CIE[§], Stern Report 2007

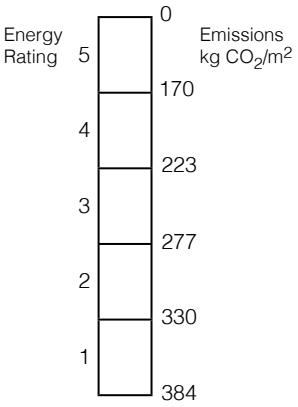
What is ABGR?

The Australian Building Greenhouse Rating (ABGR) Scheme rates buildings from one to five stars, with five stars representing lowest greenhouse emissions.

To determine the star rating and the amount of CO_2 emissions per square metre, the rating uses 12 months of data that includes – energy use, hours of operation, net lettable area (NLA), number of people, and number of computers. It can be used for the base building (central services), whole building or individual tenancies and encourages best practice in the design, operation and maintenance of commercial buildings to minimise greenhouse emissions.

Computer modelling is used to estimate greenhouse emissions for new projects.

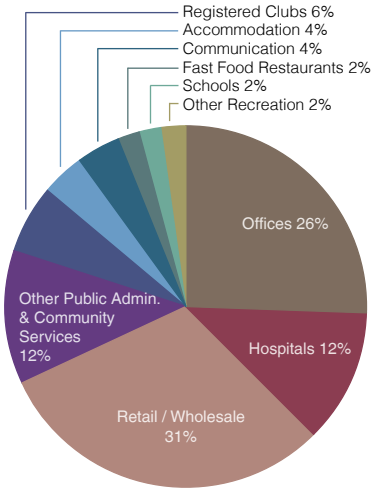
ABGR Star Rating (ABGR 2007)



Source: www.abgr.com.au

About our study – emission improvement

Commercial building sector CO_2 emissions, by building type in Australia



Acknowledging that there is a major problem with existing buildings, we have selected a commercial office building as the basis for this study.

Premium and A Grade buildings, by their very nature and compliance requirements, are largely self regulating when it comes to efficiency standards.

This review therefore looks at various energy reduction scenarios in commercial office buildings (B, C and D Grades) and quantifies the cost and level of incentives required to make deep cuts in GHG emissions that are consistent with Australia's commitments following the recent United Nations Climate Change Conference in Bali.

However, B Grade offices have a low energy compliance requirement of a 3 Star ABGR rating (according to the current Property Council of Australia's *Guide to Office Building Quality*), and C and D Grade offices have no PCA energy rating requirements.

This study therefore focuses on the B, C, and D Grade office buildings that constitute almost 60% of total office stock in terms of NLA.

Based on spot checks of existing B, C, and D Grade office buildings it is believed that most would achieve a rating of ABGR 2 Star or less.

The maximum allowable CO_2 emissions for ABGR 2 Star rated buildings is 330kg CO_2/m^2. This means that to achieve a 40% reduction, emissions must be cut to 198kg CO_2/m^2. This corresponds approximately to a rating of ABGR 4.5 Star.

For this study a B Grade 20,000m^2 GFA office building located in Melbourne has been considered. Five different scenarios have been modelled ranging from Scenario A (building items and plant replacements on an as needs basis) through to Scenario E (building and plant upgrade to achieve ABGR 4.5 Star).

We have chosen to concentrate on ABGR as a rating tool because of its focus on energy use and consequently its direct correlation to GHG emissions.

Scenario A	ABGR 2 Star
Scenario B	ABGR 3 Star
Scenario C	ABGR 3.5 Star
Scenario D	ABGR 4 Star
Scenario E	ABGR 4.5 Star

Summary of options and assumptions used in financial models

- Existing building – 20,000m^2 GFA (17,000 m^2 NLA) with approximate ABGR 2 Star rating.
- Whole of building investigated (including landlord's and tenant's power).
- Net rental $250 for existing building with incremental rises up to $320 for Scenario E.
- Vacancies adjusted during new works; long term vacancies 20% in Scenario A ranging to 5% for Scenario E.
- Landlord's and tenant's power based on actual example.
- Electricity price escalation of 10% pa over 10 years.
- Outgoings based on actual example and checked against PCA – Survey of Operating Costs.
- Gross leases based on owner retaining energy savings.
- Appropriate market capitalisation rates have been assumed.
- Target IRR based on economic return to encourage investment (11% to 13%) over 10 years.
- Incentive is the theoretical capital injection or other benefit (eg accelerated depreciation) over 10 years required to achieve target IRRs.

Study findings

Five options have been considered ranging from business as usual to an upgrade to achieve ABGR 4.5:

Scenario A	Plant replacements on as needed basis; no building refurbishment
Scenario B	Building and plant upgrade to achieve **ABGR 3 Star**; no building refurbishment
Scenario C	Building and plant upgrade to achieve **ABGR 3.5 Star**; minimum building works associated with services works
Scenario D	Building and plant upgrade to achieve **ABGR 4 Star**; minimum building works associated with services works
Scenario E	Building and plant upgrade to achieve **ABGR 4.5 Star** with major phased refurbishment

Summary of findings

Scenario:	A	B	C	D			E		
Star rating and emissions									
ABGR Star rating	2	3	3.5		4			4.5	
Approx emissions kg CO_2/m^2 pa	330	277	251		223			196	
Approx % reduction in CO_2 pa	0%	16%	24%		32%			40%	
Capital investment required to achieve emission reductions									
Building and services works ($)	$0	$1.78m	$3.43m		$6.59m			$17.78m	
Decanting/staging ($)	$0	$0	$0		$0			$1.47m	
Total ($)	$0	$1.78m	$3.43m		$6.59m			$19.25m	
$$m^2$$ GFA	$0	$89	$172		$330			$962	
Financial model outcomes									
IRR (before incentive) (%)	**-3.59%**	**6.07%**	**6.50%**		**10.12%**			**10.52%**	
Commercial target IRR (%)	NA	NA	NA	11%	12%	13%	11%	12%	13%
Incentive required to reach target IRR (NPV) ($)	NA	NA	NA	$3.7m	$8.0m	$12.2m	$2.6m	$8.1m	$13.6m
NPV of incentive ($$m^2$$)	NA	NA	NA	$185	$400	$610	$130	$405	$680
Pay back period (on cumulative cash flow basis) (Yrs)	NA	NA	NA	**3**	**3**	**3**	**5**	**5**	**5**

NA – does not meet emission reduction requirements.

Observations from study

- Scenarios A, B & C do not meet the required emissions reductions.
- Scenario D (ABGR 4) achieves a 32% reduction in emissions which meets with the national average requirement to meet the Bali Road Map but does not achieve the preferred deep cuts scenario for the built environment.
- Scenario E (ABGR 4.5) achieves a 40% reduction in emissions which complies with the preferred deep cuts scenario for the built environment.
- However, Scenario E (ABGR 4.5) is not considered to be an attractive investment opportunity for most property investors without new incentive schemes.
- Emissions trading alone will not be sufficient enough incentive for the majority of property owners to upgrade their existing building's performance.
- Some form of capital injection or benefit (ie accelerated depreciation) will be required from government in order for a majority of existing building owners to be motivated.
- The level of incentive calculated to achieve the target IRR is speculative but range from $2.6m (NPV) for an 11% IRR.
- If this speculative incentive is extrapolated to all commercial buildings in Australia, the required government funds would be a minimum of $4b over 12 years in the form of cash injections or benefits (eg accelerated depreciation).
- The upgrading of existing buildings to achieve ABGR 4.5 Star will provide some positive advantages for the building owners and tenants including: reduced energy costs, reduced impact of future emissions trading, reduced emissions, reduced obsolescence, provision of prudent risk management, enables a more competitive building – enhances building tenant appeal, provision of improved capital value and increased rental growth.
- It is also noted that the Building Code of Australia (BCA) Section J will also need to be upgraded to require ABGR 4.5 as a minimum for new buildings.

This study is focused on reductions in emissions and has not considered upgrading to achieve Green Star ratings. It is believed that the majority of building owners would also consider upgrading to higher Green Star ratings if they received sufficient incentive to upgrade their buildings to ABGR 4.5. However, it is assumed that funding of this additional work may not attract new incentive allowances.

Incentives

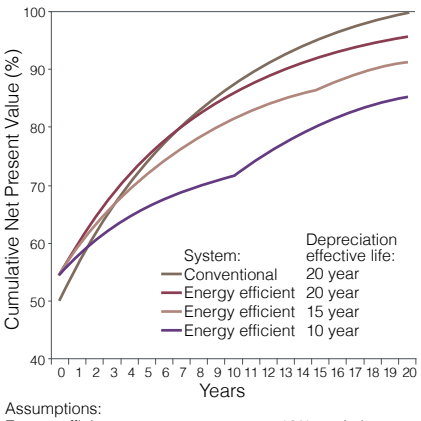
It seems clear that emissions trading schemes alone will not provide incentive enough to encourage the extensive capital injection required to upgrade existing commercial office buildings. Building owners will need to see other incentives to upgrade their property. Recognition that their property will progressively become obsolete (change in tenant expectations) will become a greater force but so will other forms of government assistance.

The introduction of **accelerated depreciation** enhances the rate of after tax return of capital upgrades thereby increasing market participation. Building components that meet an energy reduction target could be eligible for accelerated allowances.

If, for this new investment, it could be argued that depreciable assets be subjected to a 20% accelerated depreciation rate it would result in Scenario E's IRR of 10.52% increasing to 11.06% – a reasonable incentive!

The property industry will need to debate what incentive is required and demonstrate how this is best applied and what benefits will be achieved.

Forecast accelerated depreciation on energy efficient systems



Assumptions:
Energy efficient system components +10% capital cost premium, -10% annual operational costs.

Urgency

If Australia is to meet the 2020 emission commitments there is an urgent need to make macro policy decisions about making deep GHG emission cuts in the built environment and the associated methodology.

The extent of energy efficiency upgrading required in most existing building stock is considerable. This will require planning, building approvals, ABGR certification for base buildings and tenancies, incentive approval (if adopted), progressive temporary relocation of staff, staged construction, commissioning/building tuning and certification. This process can take over five years per project where building owners choose to stage works in order to retain existing tenants.

So if the macro policy decisions take, say, one year, there are only some 11 to 12 years left to complete the emission compliance works on more than 17 million square metres of ageing office buildings in Australia. With some individual projects taking over five years as noted previously, this will be an Herculean task due to the high cost, design resource limitations, construction industry resource limitations, certification resources, reluctance of some building owners, etc.

All of this adds up to an urgent need to:

- make macro policy decisions about making deep GHG emission cuts in the built environment,
- make policy decisions on implementation methodology, and
- get the relevant design professions and construction industry geared up for the programme.

Endnotes:

* *Combating climate change: how can cities best adapt?* (FiBRE, Findings in Built & Rural Environments) May 2006
§ *Capitalising on the building sector's potential to lessen the costs of a broad based GHG emissions cut* CIE Centre for International Economics Canberra & Sydney September 2007
# *Building Refurbishment – Repositioning your asset for success* Jones Lang LaSalle March 2005
^ Australian Greenhouse Office 2004 National Greenhouse Gas Inventory for 2004
Australian Commercial Building Sector Greenhouse Gas Emissions 1990 – 2010
Property Council of Australia *Office Market Report*
Property Council of Australia *A Guide to Office Building Quality*

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