

## ***Emissions Reductions Technologies, Policies and Investment***

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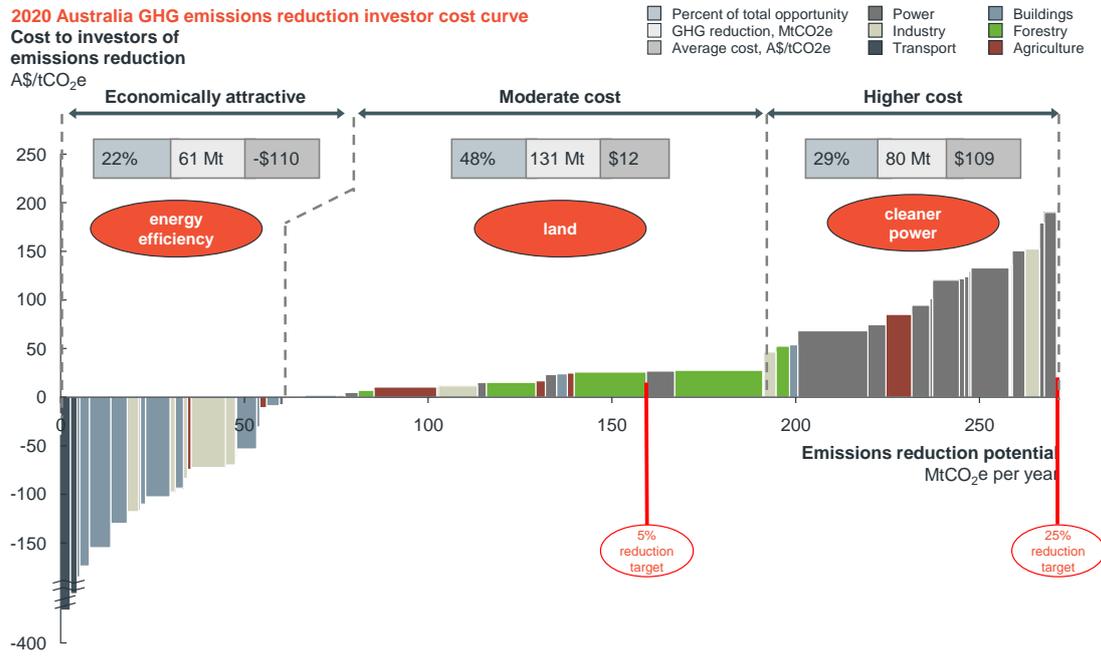
Australia achieved a significant milestone with the passage of the Clean Energy Future legislation last month. The passage of the legislation will finally create an emissions trading scheme for Australia, with trading to begin in 2015 after a three-year introductory phase in which the scheme will be operating with a fixed, rising price starting at \$23/tonne. For Chinese investors, this will provide an opportunity to compare the operation of Australian emissions trading with the Chinese pilot schemes, and also to observe or invest in technologies in Australia experiencing increased demand.

It is important to note that the Clean Energy Future policy package is more than just a carbon price; it also offers significant complementary measures to help boost business uptake of energy efficiency and carbon farming, and support investment in cleaner power generation. Analysis completed by ClimateWorks Australia in August 2011 (*Low Carbon Growth Plan for Australia – Impact of the carbon price package*) shows that together with the carbon price, these programs could reduce Australia's emissions by 124 million tonnes of carbon dioxide equivalent. If the programs are implemented well, this could take us more than three-quarters of the way towards achieving the minimum emissions reduction target of 5 per cent below 2000 levels by 2020 through domestic action, with the remainder to be met through purchasing international offsets.

ClimateWorks' analysis in particular looked at the impact of all the measures in the government's carbon price package on abatement opportunities identified in its award-winning 2010 research, the *Low Carbon Growth Plan for Australia*. This research assesses the abatement potential identified in Australia using the McKinsey cost curve methodology. This methodology ranks emissions reductions activities by their cost and the emissions they avoid, and focuses on technologies and practices that are commercially available.

The Low Carbon Growth Plan shows that Australia already has technologies and practices available that could reduce our emissions by at least 25 per cent below 2000 levels by 2020 (272 million tonnes). These activities fall broadly into three categories, in order of cost: energy efficiency, land use and cleaner power generation. Energy efficiency has potential to contribute 22% of the total (61 million tonnes), land use 48% (131 million tonnes) and power generation 29% (80 million tonnes). Brief descriptions are provided below, and their relative costs or savings and emissions abatement potential can be seen in charts 1 & 2, with cost shown on the vertical axis and emissions reduction volume on the horizontal axis.

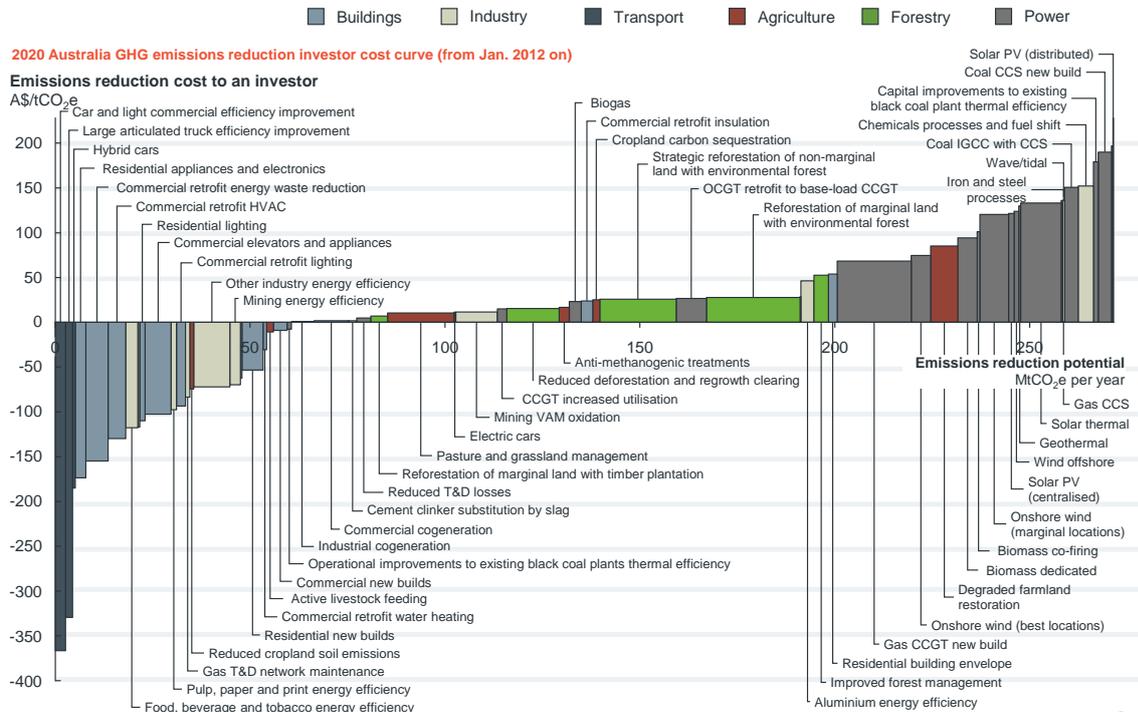
## The ClimateWorks Low Carbon Growth Plan identified 272 MtCO<sub>2</sub>e of abatement opportunities – and their costs



SOURCE: ClimateWorks Australia, *Low Carbon Growth Plan for Australia*

1

## Extensive data sits behind the analysis for each opportunity



1 Assuming that no significant action is taken in 2011, and that 2011 projections for business-as-usual emissions in 2020 will stay stable in 2012  
 SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 5)

2

Opportunities to reduce emissions in buildings are among the least cost activities. Nearly all of these can be structured to offer net financial savings. These include:

- Increasing new buildings' energy efficiency above current standards. These improvements could be achieved through improved building design and orientation, improved insulation and air tightness, usage of better materials and more efficient heating, ventilation and air conditioning (HVAC) and water heating systems.
- Improved efficiency through technology. These include actions such as replacing inefficient light bulbs, improving the energy efficiency of all appliances and equipment, but also decreasing energy losses experienced with open refrigeration, insufficiently insulated ovens or water mains. It also involves switching to less carbon-intensive fuels when possible, for example using more gas and solar-powered instead of electric water heaters. Implementing or upgrading control systems for lighting and HVAC systems can also reduce fixed energy use, especially in subsectors such as offices or hotels. Most technological improvements also deliver secondary benefits in terms of reduced need for HVAC. For example, putting doors on refrigeration systems reduces the heating load of supermarkets and improving the insulation of large ovens or installing more efficient light bulbs decreases the cooling load of restaurants or offices.
- The cheapest opportunity in existing buildings is in reducing energy waste, which could deliver at least 10% energy savings with very little capital expenditure. This includes actions such as reducing oversized and unnecessary equipment and better management of existing controls systems.
- Residential sector potential from increased insulation of existing buildings and replacement of greenhouse intensive water heaters by heat pumps or solar and high-efficient gas water heaters is largely captured by existing policies. Other major opportunities include the replacement of CFL light bulbs by LEDs and increased efficiency of appliances and equipment above current levels.

Energy efficiency is also a source of key opportunities in the industrial sector, with many also offering net financial savings. These include:

- Improved control systems and processes, reduction of duplicated or oversized equipment, upgrade of motor systems, decrease of energy losses in boilers and steam distribution systems, waste heat recovery for pre-heating or other uses, and building utilities.
- Emerging technologies in aluminum smelting (drained wetted cathode and inert anode) and mining (improved weighing system to optimise truck loads or more accurate autonomous drilling) should also contribute to energy efficiency by 2020.
- Technologies currently under development include: Ventilation Air Methane (VAM) oxidation which can reduce fugitive methane emissions from gassy underground mines by 70%; Carbon Capture and Storage which could produce significant emissions reduction by 2030; emerging technologies such as improved weighing system to optimise truck loads or more accurate autonomous drilling which reduces total drilling requirements could also save 7% in mining energy use.
- Cogeneration (also called combined heat and power or CHP) provides primary energy savings by creating heat and electricity from the same fuel source. The

potential is particularly high in commercial buildings and in the Iron and Steel industrial sectors, where all electricity use could be generated internally through this process.

- Other opportunities such as fuel or ingredient shift, industrial process improvement and reducing discharges of natural gas also represent opportunity to reduce emissions by significant volumes in Australia by 2020. Major opportunities include replacement of remote mines' inefficient gas or diesel generators by solar generators, fuel switches such as replacing coke by biomass for iron and steel production or clinker by slag in cement production, improvement of chemicals processes and catalysts and improved maintenance of the gas distribution system in remote locations.

Next in cost order are the opportunities for land-based carbon sequestration and reducing emissions from livestock. These include:

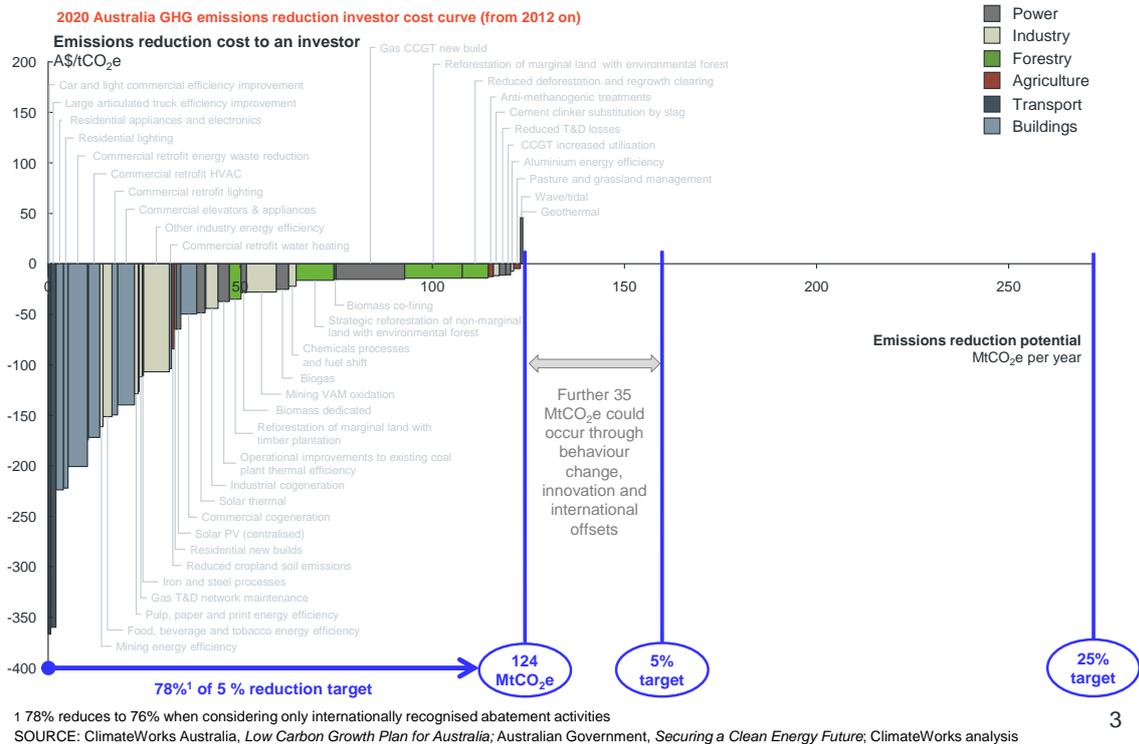
- Reducing cropland soil emissions is the lowest cost opportunity in agriculture, primarily involving reducing tillage, which reduces carbon emissions through less disturbance of the soil, and improved nutrient management, which reduces nitrous oxide (N<sub>2</sub>O) emissions through more precise application of fertiliser. These practices save farmers money via reduced labour, tillage and fertiliser costs, but there is not a large volume of emissions reduction opportunity nationally as these practices are already widely adopted.
- Reducing livestock emissions, through active livestock feeding that allow animals to gain weight more quickly with higher quality feed, and anti-methanogenic treatments such as vaccines, that act to reduce the prevalence of methane producing methanogens in livestock (many of these are still being trialled).
- Improved pasture management and natural grassland management, involving optimising grazing intensity and timing to maximise productivity and carbon sequestration, increasing the prevalence of deep rooted perennial grass species, managing fire and improving fertility via nutrient application and applying organic substrates to increase the soil's ability to support vegetation and store carbon.
- Cropland carbon sequestration, by increasing the use of deeper rooted crop varieties that allocate more carbon to the soil, and reducing the use of bare fallow and planting cover crops.
- Reforestation and reduced deforestation provide large abatement potential given Australia's large volumes of land.
- Reforestation can also be achieved while maintaining agricultural production. These options include: environmental plantings on less-productive land – agricultural land is planted with native forest not for harvest, providing aesthetic and biodiversity benefits; timber plantation on less-productive land – timber is planted for eventual harvest on land that is less suitable for other purposes, and the timber provides a source of revenue for farmers; strategic reforestation of productive land with environmental forest – best practice farming suggests that if around 2% of productive farm land is planted with trees in the form of windbreaks, plantings along waterways and tree islands to shade livestock, this is likely to increase the long term productivity and sustainability of farming enterprises.

Lower emissions power generation is the third major category of emissions reduction potential. The power or electricity generation sector is Australia's single largest sector for direct emissions. An abundance of cheap domestic thermal coal and a moratorium on nuclear power are the main drivers behind the high carbon intensity of Australia's power sector, which ranks in the top five worldwide, just below South Africa and on par with China.

The largest near-term opportunities for emissions reduction in the power sector are in displacing coal-fired generation with onshore wind, coal to gas shift, and solar thermal with storage. These currently require policy support to compete economically. Opportunities that offer net savings in the power sector are improved coal and gas power plant thermal efficiencies and reduced transmission and distribution losses.

The introduction of the Clean Energy Future legislation improves the economics of most opportunities in these three areas by putting a price on carbon, creating a signalling effect for long-life assets, and additional complementary measures that provide financial support. Chart 3 shows how much of the emissions reduction potential would become attractive to implement under the current policy settings, assuming the carbon price remains at the 5% cap level, which means it begins at \$23/tonne in 2012 and rises at 2.5% per year in real terms for three years and then is set by the market on the basis of a total cap on emissions being 5% below 2000 levels in 2020. As can be seen from Chart 3, this price does not become high enough to stimulate investment in most of the lower emissions power generation technologies.

## Potential that could be implemented under the Government's carbon price policies set at the minimum 5% emissions cap



The combination of the complementary policy measures with the carbon price has the potential to more than double what Treasury modelling estimated could be achieved in Australia through the emissions trading scheme alone (58 million tonnes by 2020). This is because a carbon price (such as through an emissions trading scheme) stimulates some but not all of the least cost emissions abatement activities. Other barriers mean that a carbon price alone – felt by most businesses through higher electricity or gas prices – does not necessarily mean that businesses will undertake all the emissions reductions available even though they are technically cost-effective. The complementary measures are designed to overcome many of these barriers.

These barriers include:

### Capital constraints and investment priorities

- Finite access to capital means emissions reduction projects are low priority
- It is difficult to access loans for energy efficiency projects or projects with higher risk
- The payback period on investment is too long to attract investment
- The return on capital does not meet the internal hurdle rate

### Information gaps and decision process

- Access to information on emissions reduction opportunities is limited
- There is a lack of awareness of the potential financial or productivity benefits
- Emissions reduction projects are not core business and staff don't have required skills
- Scientific or technical uncertainty about an opportunity is preventing its uptake

### **Market structure/supply**

- Electricity pricing has been negotiated at non-market rates, reducing the attractiveness of energy efficiency projects
- Split incentives exist that see someone other than the investor benefit from financial savings (e.g. owner/tenant, current/future)
- Without aggregation, the project is too small for an individual business (high transaction costs, limited profitability)
- It is difficult to access energy efficient equipment through existing supply channels
- The market is too small or immature to guarantee reliability/quality of supply
- There are not enough workers with the skills to make large-scale deployment possible

These barriers affect nearly all of the opportunities identified in the Low Carbon Growth Plan for Australia. ClimateWorks' analysis of the Clean Energy Future policies suggest that it can help overcome the barriers for almost half of the total volume identified.

Many of the energy efficiency opportunities are made more cost effective by the carbon price, and there are further measures to help overcome the barriers of access to upfront capital through the Clean Technology Investment Program that will award grants for investing in more energy efficient equipment, and a new white certificate scheme through the national Energy Saving Initiative (ESI) that can help support the supply chain and lower transaction costs through aggregation of smaller opportunities.

Funding provided by the new \$10 billion Clean Energy Finance Corporation (CEFC) could unlock the emissions reduction potential in commercial and industrial cogeneration, as well as support larger-scale clean power generation such as solar thermal. In addition in the Power generation sector, there is funding offered for the early retirement of 2000 MW of brown coal, providing an opportunity for lower- emissions technology to enter the market.

Many land and forestry opportunities, such as reforestation and on-farm emissions reductions, are now eligible for significant support. Programs such as the Carbon Farming Initiative – providing offset credits that can be sold from 1 July 2012 to emitters – and the Carbon Farming Futures program of grants funding will help overcome informational barriers and transaction costs, while the formation of brokers who can aggregate opportunities on behalf of farmers can partially overcome capital constraints and fragmentation issues.

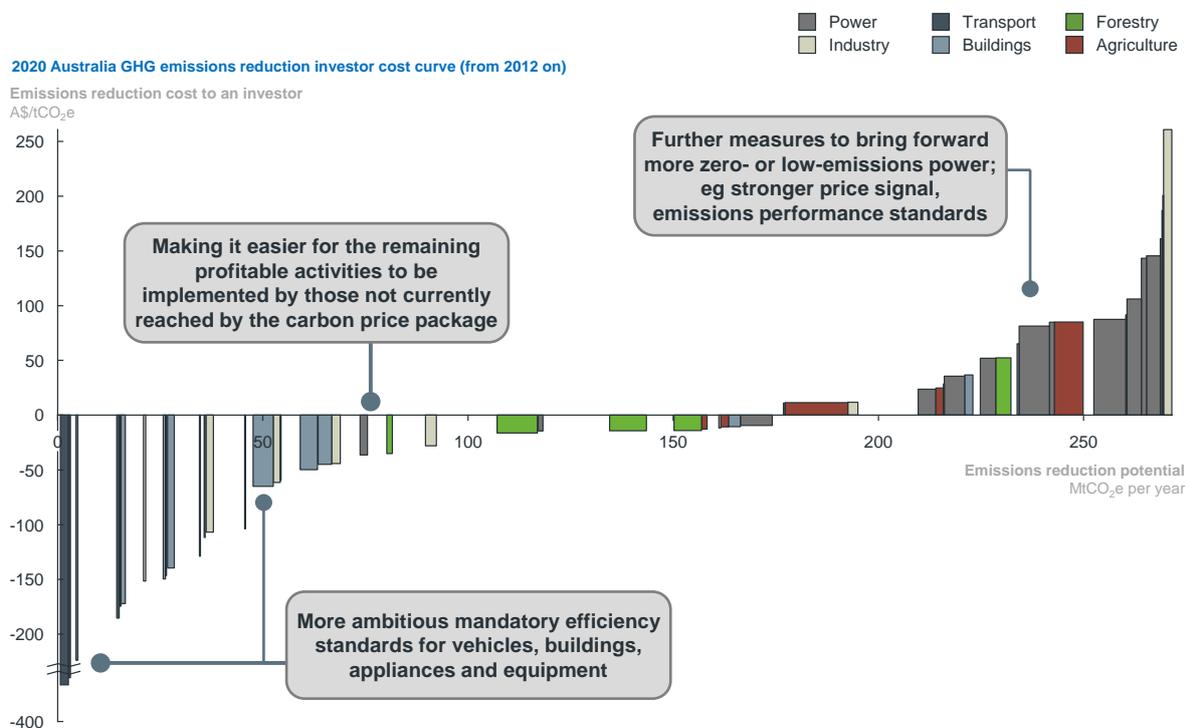
Of course, smart program design and delivery by Government will be critical to ensuring the complementary measures in the carbon price package deliver their full potential for emissions reduction. We need to be closely monitoring progress. Successful delivery of the package would provide solid evidence for strengthening Australia's 2020 pollution cap from 5 to 25 per cent when it is reviewed by the independent Climate Change Authority in two years.

The remainder of the opportunities require a higher price signal or other measures to make them attractive to businesses investors. Chart 4 shows the remaining opportunities that will not be unleashed by the current policy settings. Key policy steps to stimulate this further potential include:

- Raise the emissions reduction target to 25% from 5%. This will provide a higher carbon price, making a significant impact on the economic attractiveness of some of the power sector opportunities
- More ambitious mandatory efficiency standards for vehicles, buildings, appliances and equipment. These are simple and effective in ensuring emissions reductions through improved energy efficiency.
- Emissions performance standards for power generation and/or further measures to bring forward more zero- or low-emissions power generation.
- Making it easier for the remaining profitable activities to be implemented by those not currently reached by the carbon price package. This could be done by extending the coverage of the existing complementary measures as they are able to reach some but not all of the abatement volume available nationally.

Investors can also use Chart 4 to observe the higher cost technologies that could benefit from further innovation to reduce capital costs or transaction costs.

### This allows us to show where further action will be needed



For investors, the new policies in Australia combined with available technology solutions provide a new marketplace of opportunity. The cost curve research in ClimateWorks' Low Carbon Growth Plan for Australia can be used as a guide to the technologies that are likely to see increased demand – as shown in particular Chart 3 above. This research shows that when the carbon price mechanism starts next year at \$23/tonne, there are millions of tonnes of abatement opportunities that are economically attractive. This creates opportunities for designers, manufacturers and installers of energy efficient equipment, carbon farming techniques and low-emissions power generation. There will also be new opportunity for market-makers who can help these products reach the intended users and provide advice on energy and emissions management. For the future, the research also shows where further efforts are required to bring down costs or reduce implementation barriers in the remaining technologies, as shown in Chart 4.

With a new global agreement now forecast by 2015, Australia can provide a demonstration platform for providers of solutions that will ultimately have worldwide need.

The research referred to above can be downloaded at [www.climateworksaustralia.org](http://www.climateworksaustralia.org) under Publications, or direct links here:

- <http://www.climateworksaustralia.org/Low%20Carbon%20Growth%20Plan.pdf>
- [http://www.climateworksaustralia.org/LCGP\\_Impact\\_of\\_the\\_carbon\\_price\\_package\\_Aug\\_2011\\_revised\\_edition.pdf](http://www.climateworksaustralia.org/LCGP_Impact_of_the_carbon_price_package_Aug_2011_revised_edition.pdf)