

Comment

A number of emerging international studies are showing that the deep cuts in greenhouse gas emissions needed to stave off severe global warming effects can actually be achieved, economically, by 2050.

THE FIRST CUTS MUST BE THE DEEPEST

The International Panel on Climate Change (IPCC) has warned repeatedly that nations will need to shift towards a low-carbon future, more or less immediately, in order to avoid the dangerous effects of climate change being discussed by researchers around the world.

New York Times journalist Elizabeth Kolbert, in a 'Climate of Man' series earlier this year, wrote that 'at 378 parts per million (ppm), carbon dioxide levels are significantly higher today than they have been at any other point in the Antarctic record uncovered to date. It is believed that the last time carbon dioxide levels were in this range was three and a half million years ago, during what is known as the mid-Pliocene warm period, and they likely have not been much above it for tens of millions of years.' According to the IPCC, these figures mean that the concentration of atmospheric carbon must be stabilised at double pre-industrial levels, roughly 550 ppm, which will require deep cuts to global carbon dioxide (CO₂) emissions of 60 per cent or more by 2050.

Many nations are now committing to a Post-Kyoto Framework that addresses the issue of how deep cuts can be achieved fairly and effectively. The Conference of Parties to the United Nations Framework Convention on Climate Change, held recently in Montreal, brought together the first-ever meeting of signatories under the 1997 Kyoto Protocol and is evidence of the beginnings of this international cooperation. The Post-Kyoto Framework talks hammered out during the historic gather-

ing were attended by 189 nations.

In the lead-up to the Montreal convention, Australia's representative at the meeting, Federal Minister for the Environment and Heritage, Senator Ian Campbell, signaled 'quite a substantial difference in the Australian and American decision' on the talks about the Post-Kyoto Framework. He highlighted the government's belief in trying to build a constructive framework post-Kyoto, and 'the need for a comprehensive agreement amongst all, or the majority of emitters'. The convention, however, concluded with both Australia and the US not signing the extended framework, a decision the government reports was based on ongoing disagreement with the 'short-term, national targets and timetables approach enshrined in the Kyoto Protocol', and the preference for non-binding, regional, technological-based solutions for emission reductions.

The government maintains that, despite its refusal to commit to the Kyoto Protocol, Australia is one of only a few nations on track to meet the initial Kyoto 1990 targets by 2012. Meanwhile, a report by the Bonn-based United Nations Climate Change secretariat last month stated that emissions have risen 23 per cent over the last 13 years. Although it is unclear at this stage whether the report takes into account

Numerous dry season fires and drifting smoke on Cape York Peninsula, Queensland, taken by NASA's Aqua Satellite in 2002. Fires in Australia's northern areas account for a significant percentage of our national emissions. NASA, Visible Earth Images, <http://visibleearth.nasa.gov>



1 www.abc.net.au/worldtoday/content/2005/s1524008.htm



Newport Beach, California. Local government in the state has publicly announced the target of an 80% reduction in emissions by 2050 through innovative regulatory mechanisms. Scott Leigh

recent one-off reductions in land-use emissions in Australia, it reinforces that concerted emissions reduction action must be pursued.

Cuts won't cost the Earth

There is, therefore, great interest in Australia and other nations in knowing how 60 per cent reductions in greenhouse gas emissions can be achieved by 2050, and at a profit.

In June 2005 the Governor of California, Arnold Schwarzenegger, announced an 80 per cent target of greenhouse gas reductions by 2050 and stated that 'California is going to be the leader in the fight against global warming. I say the debate is over. We know the science, we see the threat, and the time for action is now.' This announcement follows the example of government leaders in the UK, Sweden, the Netherlands and Denmark, who have publicly committed to 50 to 60 per cent reductions in greenhouse gas emissions by 2050.

Internationally, there are now over 10 fully costed deep-cut studies available showing that nations can achieve 30 to 60 per cent greenhouse gas emissions by 2040–50, without harming economic growth significantly.²

Respected greenhouse specialist Adjunct Professor Alan Pears, of RMIT University, explains: 'Achieving greenhouse gas emissions reduction sounds like a daunting prospect, and many people imagine that we will have to freeze in the dark, shut down industry, and face misery. But remember, we don't have to slash greenhouse gas emis-

sions in a couple of years – we are expected to phase in savings over decades.

'This allows us to take advantage of the fact that most energy producing or using equipment, from fridges and computers to cars and power stations, has to be replaced every five to 30 years. So we can minimise costs by making sure that, when old equipment is replaced, low greenhouse-impact alternatives are installed.

'For example, by 2020, most of Australia's coal-fired power stations will be more than 30 years old – and they will have to be re-built or replaced. Renewable energy, cogeneration and high efficiency energy supply technologies (such as fuel cells) could replace them. Similarly, most household appliances are replaced every 15 years; in 2006, you will be able to choose a super-efficient fridge that generates a third as much greenhouse gas as today's 5-star fridge,' he says.

Target wider sources and gases

Decision makers and citizens may struggle to see how deep cuts to greenhouse emissions are possible because they assume electricity is responsible for most emissions. It is not widely known that 20 per cent or more of global emissions come from non-CO₂ sources. In Australia in 2003, quoting the Australian Greenhouse Office's latest inventory figures, greenhouse gas emissions from electricity generation accounted for 35 per cent of Australia's emissions. Other major sources are reported as being agriculture (18%) transport (15%), industrial processes (6%), and landfill (2%).

Non-CO₂ gases currently account for well over 50 per cent of the emissions in

² See: www.wwf.org.au/News_and_information/Features/feature10.php

Comment

Brazil and India, for example, as compared to 20 per cent in the United States and 27 per cent for Australia. There are, in fact, six classes of greenhouse gases, other than CO₂, recognised by the Kyoto Protocol and the IPCC as causing global warming (see table).

The non-CO₂ gases have significantly higher global warming potentials and atmospheric lifetimes than CO₂. Carbon dioxide on average lasts 100 years in the atmosphere, but sulfur hexafluoride (SF₆), for instance, has a global warming potential 23 900 times higher than that of CO₂ and lasts 3000 years in the atmosphere. This means that one SF₆ molecule has the same effect on warming the planet as 23 900 CO₂ molecules and lasts 30 times longer in the atmosphere than CO₂.

Recent Massachusetts Institute of Technology (USA) modeling has confirmed that including strategies to reduce non-CO₂ emissions improves the effectiveness of climate change abatement by two-thirds. This is significant because most economic modeling on the costs of mitigating climate change has completely ignored non-CO₂ emissions to date.

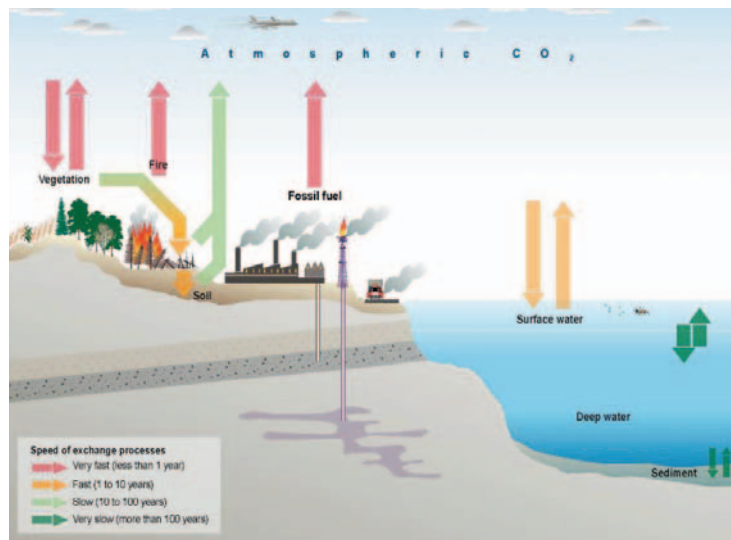
DuPont, for example, was able to achieve major and profitable reductions in greenhouse gas emissions largely by reducing and replacing the non-CO₂ greenhouse gases; that is, largely through reducing the emissions of hydrofluorocarbons (HFCs), petrofluorocarbons (PFCs), nitrous oxide (by 80 per cent) and methane (by 40 per cent). There is a range of industry sectors that have opportunities to find similar innovative and creative solutions that both reduce the production of greenhouse gas emissions and increase economic growth.

Regulation and innovation for progress

Where then should nations start? Often the most effective solutions are not the most obvious ones. In the case of reducing greenhouse gas emissions from electricity generation, changes to regulation and the use of market-based mechanisms would make a significant difference and are a great place to start.

Electricity generating companies in Australia and across the world are rewarded for selling more kilowatts, rather than being rewarded for encouraging the energy efficiency of their clients, and thus selling less. The system provides incentives for electricity companies to compete to produce more and more cheaper electricity. There is no incentive for the energy utilities to sell less electricity.

But now a few governments around the world, like those in California and Oregon, have drafted legislation to reward utilities for selling less energy. Such regulatory reform typically lets the utilities keep as extra profit part of any savings created for their customers and business clients,



Differences in the speed of various phases of the global carbon cycle affect the build-up of atmospheric carbon in the atmosphere. IPCC

together with savings in infrastructure development costs, as less energy is demanded. For example, being able to retain 15 per cent of these savings inspired Pacific Gas and Electric (PG&E), the US's largest private energy utility, to put a halt to building or planning any new conventional power plants. For any new power generation projects PG&E will instead invest in renewables.

This market-based regulatory approach has made it possible to effectively decouple the utilities profits from the actual quantity of kilowatt hours produced and sold; in other words, ensuring that the energy or water utility is no longer rewarded for selling more energy, nor penalised for selling less. Using this method as far back as 1992 in California, PG&E invested over US\$170 million to help customers save

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electricity more cheaply than the utility could make it. That investment created US\$300 to \$400 million worth of savings. Customers received 85 per cent of those savings as lower bills, while the utility's shareholders received the rest – over US\$40 million – as extra profits: the perfect win-win option for the energy supply sector.³

Such regulatory reform also creates a new market incentive to pursue energy efficiency – which makes business sense to do anyway because saving energy is cheaper than buying it. Many energy efficient products, once costly and exotic, are now inexpensive and commonplace. Electronic speed controls, for example, are mass-produced so cheaply that some suppliers give them away as a free bonus with each motor. Compact fluorescent lamps cost more than US\$20 two decades ago but only US\$2 to \$5 today; they use 75 to 80

per cent less electricity than incandescent bulbs, last 10 to 13 times longer, and are now being produced in a number of shades of white and off-white to create a warmer light.

Window coatings that transmit light but reflect heat cost a quarter of what they did five years ago. Indeed, for many kinds of equipment in competitive markets – motors, industrial pumps, televisions, refrigerators – some highly energy efficient models cost no more than inefficient ones. The Meta-Efficient website provides a comprehensive overview of the most efficient products available on the global market today (www.metaefficient.com).

Quiet achievers are setting the pace

In December, The Climate Group, a UK-based, non-profit organisation, published its second edition of the report *Carbon Down: Profits Up*⁴, showing that 43 companies had

³ RMI, Saving the Utilities: www.rmi.org/sitepages/pid322.php

⁴ The Climate Group's 2004 and 2005 Carbon Down Profits Up reports: www.theclimategroup.org/index.php?pid=732

Symbol	Name	Common sources	Atmospheric lifetime (years)*	Global warming potential	Per cent of US emissions
CO ₂	Carbon dioxide	Fossil fuel combustion, forest clearing, cement production, etc.	50–200	1	79.9
CH ₄	Methane	Landfills, production and distribution of natural gas and petroleum, fermentation from the digestive system of livestock, rice cultivation, fossil fuel combustion, etc.	12	21 times	9.5
N ₂ O	Nitrous oxide	Fossil fuel combustion, fertilizers, nylon production, manure, etc.	150	310 times	5.8
HFC	Hydrofluorocarbons	Refrigeration gases, aluminium smelting, semiconductor manufacturing, etc.	264	Up to 11 700 times	1.8
PFC	Petrofluorocarbons	Aluminium production, semiconductor industry, etc.	10 000	Up to 9 200 times	
SF ₆	Sulfur hexafluoride	Electrical transmission and distribution systems, circuit breakers, magnesium production, etc.	3200	Up to 23 900 times	

Common greenhouse gas sources and effects.

*Standard Industry Classification

Sources: Energy Information Administration (1998). Form EIA-846, 'Manufacturing energy consumption survey', and Form EIA-810, 'Monthly refinery report'; Intergovernmental Panel on Climate Change (2001). *Climate Change 2001 The Scientific Basis*, Cambridge University Press, Cambridge.

significantly reduced their greenhouse gas emissions and saved a total of AU\$15 billion. They also published a report on leading cities around the world that are making similar savings to both costs and greenhouse gas emissions. Using energy more efficiently offers an economic bonanza – not because of the benefits of stopping global warming, but because, again, saving fossil fuel is a lot cheaper than buying it. Since the early 1990s, six major firms – Dupont, IBM, British Telecom, Alcan, NorskeCanada and Bayer – have collectively saved at least another AU\$2 billion by reducing their carbon emissions by more than 60 per cent.

There are now several significant schemes working with hundreds to thousands of companies that are meeting their greenhouse gas reduction targets ahead of schedule, and making good money. A new industrial revolution is effectively helping companies save energy and reduce pollution, using clean, efficient technologies and even on-site production of energy.

Nearly 100 case studies charted by the Center for Energy & Climate Solutions⁵ (Arlington, USA) for their *Cool Companies* project demonstrate how one business after another is earning the equivalent of

40 to 50 per cent returns on energy saving investments. Savings bring not only lower costs, but also measurable, documented productivity gains through improved product quality and employee morale.

Similarly, partner companies with the US-based Pew Climate Center are also meeting greenhouse gas emission targets ahead of schedule and making money through mainly energy efficiency savings, as are the US Environment Protection Agency's Climate Leaders organisations.

In the UK, the government's Climate Change Agreement Program, which involves 12 000 companies, has been an outstanding success story. British industry has performed far better than expected in cutting emissions of CO₂, ministers say. Thousands of companies achieved cuts in 2002, totaling nearly three times above the agreed targets. The Department for Environment, Food and Rural Affairs said industry had cut the amount of CO₂ it produced in 2002 by 13.5 million tonnes, more than 10 million tonnes above the targets agreed under climate change agreements.

Cities also are achieving remarkable reductions in greenhouse gas emissions, largely through efficiency. The city of Woking, England, has reduced its greenhouse gas emissions by 40 per cent and has a goal of 80 per cent by 2090. Meanwhile,

here, the City of Melbourne, has a goal of operations being climate neutral by 2020.

In Australia there are, in fact, a number of energy efficiency schemes, such as the Department of Industry, Tourism and Resource's Energy Efficiency Opportunities program, the NSW Department of Energy's Utilities and Sustainability's Energy Savings program and the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection program, that are aiming to achieve similar results. These and other initiatives will greatly assist Australia to achieve the deep cuts to greenhouse emissions that are needed over the next 50 years.

Meeting the climate change challenge and reducing greenhouse gas emissions is not going to happen through one particular technical fix or a big renewable energy breakthrough. Rather, because greenhouse emissions come from so many sources, the solution requires an integrated approach. Deep cuts to greenhouse gas emissions can and must be achieved across the wide range of sources of emissions, and the promising leads taken so far by the pace-setters needs to be earnestly followed.

● Michael H Smith and Karlson 'Charlie' Hargroves, The Natural Edge Project.

Further articles on greenhouse emissions reduction solutions are planned in ECOS.

More information:

See section 4 from Hargroves K and Smith M (2005). *The Natural Advantage of Nations: Business Opportunities, Innovation and Governance in the 21st Century*, Earthscan, London. www.naturaledgeproject.net

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Turton H, Ma J, Saddler H and Hamilton C (2002). 'Long-term greenhouse gas scenarios', Discussion Paper No. 48, The Australia Institute, Canberra.

5 See: www.energyandclimate.org/index.cfm