



**ENGINEERS
AUSTRALIA**

**AUSTRALIAN CLIMATE CHANGE
POLICIES
Submission to the Garnaut Review**

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1. INTRODUCTION

Engineers Australia is the peak body for engineering practitioners in Australia, representing all disciplines and branches of engineering. Membership is now approximately 83,000 Australia wide and Engineers Australia is the largest and most diverse professional engineering association in Australia. All Engineers Australia members are bound by a common commitment to promote engineering and to facilitate its practice for the common good.

Since 1989, Engineers Australia has had in place sustainable development principles to guide members in the conduct of their engineering practice. Sustainable development is an integral component of Engineers Australia's code of ethics which are agreed by all members. Engineers Australia has also formally endorsed a Sustainability Charter and a comprehensive policy on Australia's energy future and climate change.

Engineers Australia warmly welcomes the formal ratification of the Kyoto Protocol by the new Federal Government. This step has been advocated by Engineers Australia for some time. Many of the matters covered by your Review are dealt with in Engineers Australia's policy, a copy of which is attached to this Submission. At this time, Engineers Australia wishes to highlight a number of issues of particular interest to its members. In brief they are:

- The importance of the Federal Government moving quickly to adopt an emissions reduction target and the emissions reduction trajectory which will be followed to achieve it. Implicit in the emissions reduction trajectory are short term targets which in view of the uncertainty surrounding the degree of reduction necessary is seen as indispensable to avoid creating circumstances in the future where the reductions required are either exceptionally difficult to achieve or perceived by too many as impossible.
- The importance of clear, relevant and transparent information on Australia's likely future emissions and the scale of the emissions reduction task in assisting adjustment by consumers and businesses.
- The importance of pursuing broad based mitigation and adaptation policies and programs and a broad based action orientation, instead of reliance on a comparatively few case studies. Case studies are an important tool when implementing new approaches, but programs must progress

beyond messages extolling the merits of a limited list of case studies.

- Market mechanisms are vital to ensuring that the costs of reducing Australia's emissions are minimized, but they are not a panacea. There are a large number of non-market barriers impeding many of the changes required in the future, unless implemented in tandem with market mechanisms, will risk sound options to achieving lower emissions not being taken up or being more expensive than necessary. Markets will achieve the least expensive emissions reductions providing their boundaries are defined to avoid perverse outcomes.
- Energy efficiency is not only vital but must be supported with an energy efficiency target to overcome social and business inertia, to ensure that the best standards are adopted, and not just minimum standards, to address non price barriers and to address rebound factors.
- Adaptation requires more rapid and broad based mobilization to ensure that essential preparatory work is undertaken. Adaptation is required across a broad range of activities, including basic infrastructure. Some infrastructure adaptation requirements are synonymous with changes required by moving to a low emissions energy system.
- Climate change adaptation and mitigation require a range of actions involving a broad base of skills and professional expertise. Australian is already feeling the effects of a professional engineers shortage and the most recent trends in university commencements and completions suggest this is not improving. If not addressed, the shortage of professional engineers in Australia may limit options to address adaptation and mitigation.

2. THE IMPORTANCE OF AN AUSTRALIAN EMISSIONS REDUCTION TARGET

Climate change mitigation requires fundamental changes in social and business attitudes and practices. Engineers Australia believes that a successful mitigation change process in Australia is critically dependent on an announced commitment by the Federal Government to an Australian greenhouse emissions reduction target. While there has been widespread public recognition of the problems and risks posed by climate change and the concern felt by

people in general has been increasingly reflected in various polls¹, this has not been translated into general behavioural change and action. Articulation of a formal Australian greenhouse emissions reduction target will define a water-shed for change.

Engineers Australia believes that it is essential that the Review recommend to Government that an early announcement of a formal Australian greenhouse emissions reduction target is indispensable. Engineers Australia accepts that considerable work on the relationship between an Australian target and corresponding targets for other countries must be completed and negotiated. Similar issues also impede the definition of an Australian emissions reduction trajectory which is as important as the target itself. However, Engineers Australia is convinced that Australians will accept an interim target which will be confirmed through additional work in Australia and through the negotiations in the International process on climate change mitigation.

Engineers Australia is convinced that Australian want to see an emissions reduction target which is demonstrably related to climate science and government commitment to an irreversible break from the past. It is clear that, as well as uncertainty about future climate events and the extent of emissions reduction necessary to avoid the worst impacts, there is considerable uncertainty about projections of 'business as usual' projections of Australian emissions. Risk avoidance suggests that an ambitious short term target, implicit in a reductions trajectory, is the more prudent course.

There has been some discussion in the press about the merits or otherwise of short term emissions reductions targets². It is certainly true that theoretical economics allows for the possibility that the majority of Australian emissions reduction could occur later rather than sooner, suggesting support for a long term emissions reduction target without any intervening short term target. However, this is an argument about economics and not about climate change mitigation.

Climate science suggests that the progressive accumulation of greenhouse gases in the atmosphere is responsible for climate change. When considered alongside conclusions indicating considerable uncertainty surrounding the so-called 'climate tipping points' beyond which irreversible changes may occur, prudent policy must lean towards ambitious short term emissions reductions.

¹ See Section 4.4 in Engineers Australia, Australia's Energy Future: Australian Energy Policy and Climate Change, 2007, pp62-64, www.engineersaustralia.org.au

² See for example Australian Financial Review, Big Emitter group warms to Garnaut, 30 January 2008, p6

3. CLEAR, RELEVANT AND TRANSPARENT INFORMATION IS VITAL

Clear, relevant and transparent information is essential to effective emissions reduction. The long term character of climate change mitigation poses information risks beyond those typically faced by business and consumers. These relate primarily to including risk assessments based on uncertain 'business as usual' emission projections and uncertain climate impacts into business calculations in addition to the factors typical of business processes, particularly those dealing with investments in long term assets.

Government can assist business to better understand the nature and magnitude of the emissions reduction task by providing official projections of both 'business as usual' and 'with measures' greenhouse emissions which are revised regularly in open and predictable cycles. The issue here is not about shifting the incidence of business risks, but to avoid adding unnecessarily to risk through confusion emanating from widely different projections of future levels of greenhouse emissions. For example, consider the different projected greenhouse emissions produced by two highly regarded Australian agencies; the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Australian Greenhouse Office (AGO).

Projections prepared by ABARE for the Switkowski Review³ indicate that by 2050 Australian greenhouse emissions would be 874 MtCO₂-e. The Australian Greenhouse Office (AGO) produces projections of Australian emissions to 2020. These estimates are often used as the basis for longer term projections⁴ and when extrapolated to 2050 indicate that Australia's emissions would be 1218 MtCO₂-e. There is a 40% difference between these estimates and translate into corresponding differences when an emission reduction target.

Engineers Australia believes that official Australian climate mitigation policy should be based on officially sponsored modeling with all assumptions and data on the table using readily available methodologies. Projections should be revised in regular and predictable cycles to reflect more and/or better data and to reflect revised assumptions. The information and analyses available to Government should also be available to business and consumers. Open and transparent information and information processes will

³ ABARE emissions data supplied to the Switkowski Review of Uranium Mining, Processing and Nuclear Energy, Opportunities for Australia, 2007

⁴ See for example the study by CRA International, An Analysis of Greenhouse Policies for the Australian Electricity Sector, A Report for the National Generators Forum, September 2006, www.ngf.com.au/html/ and go to public papers.

allow businesses and consumers to make decisions relevant to them and so facilitate smooth adjustment. The alternative is for business and consumers to second guess official processes, or more likely, to do nothing.

4. ACTION MUST BE BROAD BASED

Engineers Australia believes that climate change adaptation and mitigation policies should be broadly based and action orientated. No sector of the economy should be excluded on special interest grounds. Exclusion of some activities will retard broad community and business acceptance that change is essential and will invite needless debate on other claims for special consideration. Just as it is possible to assist trade exposed industries to overcome perceived loss of international competitiveness in the short term, other groups who experience unusual and verifiable adjustment difficulties can also be assisted.

Change processes can benefit considerably from case studies which test new ideas and approaches. However, in Australia extolling the merits of a limited list of case studies has often substituted for action to move from case study to broad based change. Engineers Australia supports widespread use of case studies to test the viability of new processes and technologies and to promote wide adoption of those that work. However, unsuccessful experiments should be honestly assessed and, if necessary, discarded, rather than be buried in 'feel good' campaigns.

Some approaches to climate change mitigation in Australia emphasize the importance of quickly addressing sectors of the Australian economy responsible for the largest emissions. The most frequently cited example is the electricity supply sector which in 2005 was responsible for almost 36% of Australia's emissions⁵. However, nearly every sector of the economy has experienced significant growth in emissions and Engineers Australia believes it would be a serious mistake to single out sectors for early policy action.

Across the board action is vital. Some sectors where emissions may not be as great as electricity supply face particularly difficult adjustment and will need all the time available. An example is transport. The development of Australian cities and transport modes has been influenced by cheap and readily available supplies of fossil fuels. Adjustment here may well require complementary changes in

⁵ Australian Greenhouse Office, Australia's National Greenhouse Accounts, National Inventory by Economic Sector, 2005, 2007, www.ago.gov.au

transport modes and in city design as well as in the design of vehicles and the fuels they use.

5. EMISSIONS TRADING IS VITAL BUT IS NOT A PANACEA

Engineers Australia strongly supports using market mechanisms to achieve reductions in Australia's greenhouse emissions. Engineers Australia also strongly supports current efforts to develop an Australian emissions trading scheme and agrees with the view expressed by the new Federal Government that the scheme's implementation should be brought forward to 2010.

However, while carbon pricing addresses the policy barrier created from past failure to deal with emissions externalities, it does little to address other key barriers. These are technical barriers faced by new and emerging technologies, cost barriers faced in deploying and commercializing new technologies and non-price barriers. Most non-price barriers are particularly insensitive to prices. They include high initial cost barriers, even though life cycle costs are economic and lower, split incentives, social infrastructure and arrangements geared to existing technologies and incapable of dealing with new ones, inability to deal with perceived additional financial risks, consumer and business lack of knowledge and awareness, gains which are too small to warrant action by individual consumers or businesses but which collectively aggregate to substantial gains for Australia and the absence of implementation and support human infrastructure.

These issues were recognised in the Report issued by the Emissions Trading Task Force⁶. To some extent they are recognised by existing programs designed to promote lower emissions technologies, notably the Low Emissions Technology Demonstration Fund and the Mandatory Renewable Energy Target. The new Federal government has also recognised this issue by promising to increase the renewable energy target and promising to implement various actions to encourage increased energy efficiency.

As presently proposed, emissions trading will overcome the adverse consequences of one externality, failure to price carbon emissions, but will not address market inability to deal with the issues outlined above. The fragmented policies and programs now in place are insufficient. Unless the boundaries of Australia's emissions trading market are complemented from the outset addressing technical, deployment and commercialization barriers and non-price barriers, there is a strong likelihood of perverse outcomes.

⁶ Department of Prime Minister and Cabinet, Report of the Task Force on Emissions Trading, 2007, www.dpmc.gov.au

6. AUSTRALIA NEEDS AN ENERGY EFFICIENCY TARGET

The International Energy Agency rates energy efficiency as the single most important contributor to global greenhouse emissions reduction. Its study in support of the G8 Plan of Action argued that up to 45% of global emissions reductions could come from energy efficiency⁷. Energy efficiency is the most economical option to reduce greenhouse emissions from energy use. The energy cost of energy efficiency is zero, but unfortunately this property is all too often why energy efficiency does not receive the attention it deserves in economic modeling, and subsequently, policy discussion based on that modeling.

Energy efficiency is notoriously difficult to include as an endogenous variable in econometric models and this problem is typically solved using exogenous representations. By their nature the latter are not responsive to carbon prices and are too often characterized as non-economic interventions. In reality, inefficient energy use is the product of income effects out-weighting price effects, combined with the non-price barriers discussed in the previous section. Thus it becomes simpler and cheaper for many to take advantage of electricity reforms which reduce the price of electricity rather than employ energy efficiency options. The result may be efficient in some ways but it will not achieve greenhouse emission reductions.

Although most modeling related to energy use and greenhouse emissions in Australia purports to represent both energy supply and the demand for energy, the focus of attention is often on major producing sectors rather than energy end users. Subsequent policy discussion also takes on this perspective with an emphasis on industry oriented policy options rather than policies directed at end users of the products produced. Thus, for example, in the electricity supply industry, the parameters most often discussed are how a price on carbon emissions will impact on cost and in turn how the resulting increase in the price of electricity may impact on electricity consumption.

In this framework, the essential determinants of electricity demand are much as they were before carbon pricing and, while the ensuing higher prices will reduce demand, there is scant attention applied to reducing demand through energy efficiency. Electricity generators argue that they are moving to improve generation efficiency and this is often the case at the margin, but energy retailers derive revenue by selling more, not less, of it.

⁷ International Energy Agency, Energy Technology Perspectives 2006, Scenarios and Strategies to 2050, In Support of the G8 Plan of Action, OECD, Paris, 2006

For energy efficiency policies to have real traction policies will need to be directed at end users. This can most readily be achieved through an energy efficiency target focused at end user activities and taking account of the specific barriers impeding energy efficiency take-up by consumers and businesses⁸.

In the UK and Europe energy efficiency targets have been accepted as part of the policy mix. For example, in the UK residential emissions in 2005 were 42 MtC which was 28% of total UK emissions. The target set was to realize a 9 MtC reduction by 2020 (their units)⁹. In Australia the Victorian government has announced a less ambitious scheme, the Victorian Energy Efficiency Target, to reduce household non-transport greenhouse emissions by 10% from a projected level of 27.2 MtCO₂-e, but Federally there has been an unexplainable reluctance to adopt this approach.

In Australia direct emissions from residential sector in 2005 was 55.8 MtCO₂-e (transport 45.8 MtCO₂-e and non-transport 10.0 MtCO₂-e) with a further 48.7 MtCO₂-e in indirect emissions from electricity consumption. This was 18.7% of Australian emissions and another 17.9% was from the services sector. Between 1990 and 2005 residential direct emissions increased by a combined 28.6% and indirect emissions increased by 45%¹⁰. Services sector emissions increased by 23% and 62% respectively. These increases show no signs of abatement and suggest the potential for substantial energy efficiency gains in future.

Research in the UK has shown that energy efficiency improvements predicted by simple engineering models are often not achieved due to what have been called 'rebound effects'¹¹. Energy efficiency improvements often make energy services cheaper. Rebound effects occur when the resulting savings are used to purchase more of the energy service than originally intended, or redeployed to purchase other energy intensive goods or services. In extreme cases so called 'backfire' effects can occur resulting in more energy being used than before the efficiency measure was introduced.

Policies aiming to reduce greenhouse emissions through energy efficiency need to allow for rebound effects. This can be as simple

⁸ For an analysis of details of the energy efficiency target approach adopted in the UK see NERA Consulting, Evaluation of Supplier Obligation Policy Options, Report for DTI and DEFRA, February 2007, www.dti.gov.uk/files/file38976.pdf

⁹ NERA, op cit, p1

¹⁰ Australian Greenhouse Office, Australia's National Greenhouse Accounts, National Inventory by Economic Sector 2005, 2007, www.ago.gov.au

¹¹ Steve Sorrell, The Rebound Effect: An Assessment of the Evidence for Economy-wide Energy Savings from Improved Energy Efficiency, UK Energy Research Centre, October 2007, www.ukerc.uk/Home.aspx

as adjusting for the extent to which engineering predictions are reduced by rebounds. However, it has also been shown that combining energy efficiency policies with energy and carbon emissions pricing policies can lead to the mitigation of rebound effects. This suggests that the most efficient way to proceed is a holistic approach combining market based policies with energy efficiency policies.

Engineers Australia believes that Australia needs an Energy Efficiency Target which:

- Is oriented towards the combined direct and indirect energy use and related greenhouse emissions of end-users in the residential, manufacturing and services sectors of the Australian economy.
- Clearly draws the link between end-user energy consumption, energy efficiency and the national greenhouse reduction target for all common categories of energy use, for example, in Victoria in 2004-05, residential lighting was responsible for 3% of residential energy use but 9% of greenhouse emissions; similarly, appliances such as cookers and refrigerators were responsible for 17% of energy use but 33% of greenhouse emissions.
- Sets the greenhouse emissions reduction that energy efficiency is expected to achieve and attributes this target to energy efficiency improvements in common areas of end user energy consumption.
- Takes into account energy efficiency rebound effects to ensure that intended objectives are realized and/or the negative impacts of rebounds are mitigated through integration of energy efficiency and pricing policy.

7. BI-PARTISAN AUSTRALIAN COMMITMENT TO CLIMATE MITIGATION IS ESSENTIAL

International discussions centre on substantial reductions in emissions by 2050. Between now and then in Australia there will be 14 Federal elections and even more State and Territory elections. There will inevitably be several changes of government. Unless all sides of politics agree to the most important elements of climate change policy there will be a risk that Australia's efforts will be under-mined by the disruptions created by changes of directions when governments change.

Similarly, there is already widespread concern about the confusion and administrative burdens created by the plethora of emissions reductions programs put in place by different governments. The development of Australian emissions trading offers the prospect of an Australia wide approach in this area. However, non-market policies will also need to be established Australia wide and avoid spurious arguments about local conditions. Unless the Australian Government exercises decisive leadership and obtains the agreement and cooperation of all Australian governments, present confusion will persist and undermine national efforts.

8. MITIGATION AND ADAPTATION MUST BE ADDRESSED

Although important progress has occurred in alerting businesses to the risks posed by climate change and to the importance of including these risks in normal business decision making, Engineers Australia believes that Australia is lagging in its efforts to address climate change adaptation. This issue was highlighted in a Report prepared for the Victorian Government which assessed the likely implications of climate change risks for the State's infrastructure¹².

This important work draws out the wide scope of work necessary to adjust water, energy, telecommunications, transport infrastructure and buildings generally to higher temperatures, higher risks of and more frequent bush fires, more intense wind speeds and increased risks of inundation. A climate change adaptation framework is proposed involving government, institutional investors, insurance companies, sector professional associations, standards organisations and local and State planning organisations. This complex arrangement will need time and resources to address the wide range of adaptation actions necessary.

A simple example can illustrate the complexity of the task. At present, considerable effort has been devoted to modifying Australia's building code to improve building energy efficiency. This work has consumed several years work and is not yet finalized. However, the Victorian Report suggests that even more work is needed to review the capacity of buildings to withstand increased wind speed and to mitigate higher fire and inundation risks. Similar work on revised standards is necessary by water supply and sewerage authorities, by electricity supply authorities and by telecommunications authorities before actual adaptation work can begin.

¹² CSIRO, Maunsell Australia Pty Ltd and Phillips Fox, Infrastructure and Climate Change Risk Assessment for Victoria, March 2007, www.greenhouse.vic.gov.au

Engineers Australia urges the Review not to lose sight of these requirements. Extensive technical input is required across a wide spectrum of knowledge which the community regards as largely resolved. The interest shown by insurance companies in these matters demonstrates that this is an area for serious concern.

9. SUPPLY OF ENGINEERS

Australia has been experiencing a shortage of professional engineers for some years. While there are particular shortages in some specialisations, notably civil engineers and mining engineers, the situation is one of shortages across the board. Currently, this shortage is influenced by the buoyancy of the Australian economy. However, the broad spectrum of changes which will be necessary to adequately deal with climate change adaptation and mitigation means that additional pressures will arise.

The supply of engineers comprises the accumulated flow of Australian engineering graduates and the accumulated flow of immigrant professional engineers less engineers retiring from the workforce. The flow of Australian engineering graduates has either been in decline or at best static for the past 15 years, at a time when the Australian economy and its population has been growing.

This situation underscores an increasing Australian reliance on skilled migration programs to provide the necessary increases in engineers. A key mechanism here has been the ability of overseas students studying in Australia to apply for visas to remain in Australia without first returning home. The key driver of university engineering outcomes has been the rapid growth in fee paying overseas students enrolled in Bachelors and Coursework Masters programs. Combined with the ease of obtaining a visa this growth has been a major explanation of success in attracting overseas professionals. However, in recent years the numbers of overseas students commencing studies has begun to decline suggesting this avenue may become more difficult in future. Furthermore, international competition for professional engineers appears to be rising.

The professional engineering workforce, like the population at large, is aging. There is a strong likelihood that just as additional numbers of professional engineers are required to assist climate change adaptation and mitigation, the stock of professionals will be declining due to retirements and to an inadequate inflow. Renewed attention on ways to increase the supply of professional engineers will be necessary.



ENGINEERS
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Policy Statement Climate Change and Energy

Engineers Australia believes that Australia must act swiftly and proactively in line with global expectations to address climate change as an economic, social and environmental risk. Our role has been, and will continue to be, in leading capacity building to innovate for more sustainable, eco-efficient and less polluting outcomes in engineering practice. We believe that addressing the costs of atmospheric emissions will lead to increasing our competitive advantage by minimising risks and creating new economic opportunities.

Engineers Australia:

- Believes the Australian Government should ratify the Kyoto Protocol.
- Strongly encourages the direction of energy policy reform, recognising that there is some way to go before achieving the stated policy objectives of: providing efficient, reliable and competitively priced energy; responsibly developing Australia's energy resources, technology and expertise; and mitigating environmental impacts of energy production, transformation, supply and use.
- Strongly encourages actions to address the on-going growth in energy demand. It is essential that the rate of growth is minimised, if not reversed, and clearly linked to improvements in efficiency and demand management.
- Agrees with the position taken by the Stern Review that climate change is an economic, social and environmental problem.
- Believes that it is in Australia's interests to move quickly to limit greenhouse gases.
- Strongly urges the Australian Government to move quickly to introduce a carbon trading scheme, including the use of appropriate penalties, so that emissions of greenhouse gases are no longer costless and that the costs of greenhouse gas emissions be borne by emitters of greenhouse gases in proportion to their relative discharge.
- Believes that energy policy should favour as wide a portfolio of measures as possible. Market forces should determine the most effective measure for particular situations in most cases. Where market forces are not a complete answer to the choice of climate mitigation options, government should assist newer options to develop their maturity through regulation and other non-market activities.
- Believes that it is vital that the potential for synergy between emerging energy options that can be deployed in Australia and the development of new export markets should be thoroughly explored.

Endorsed by the National Council of Engineers Australia, 22 February 2007