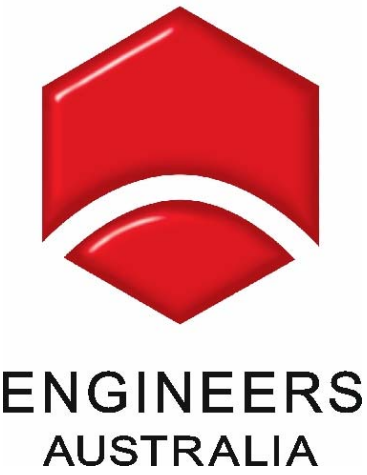
INQUIRY INTO SEQUESTRATION TECHNOLOGY

House of Representatives Standing Committee on Science and Innovation



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INTRODUCTION[1]

Engineers Australia is the peak body for engineering practitioners in Australia, representing all disciplines and branches of engineering. Membership is now approximately 80,000 Australia wide and *Engineers Australia* is the largest and most diverse 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. *Engineers Australia* is grateful for this opportunity to contribute to the House of Representatives Standing Committee on Science and Innovation Inquiry into Geosequestration Technology.

Engineers Australia is currently reviewing its position on Australia's energy future. This work is related to *Engineers Australia's* strong support for sustainable development and to the character of *Engineers Australia* membership. Members` views cover a wide spectrum, reflecting their individuality and career interests. *Engineers Australia* members are engaged in all aspects of energy and transport industries and include nuclear, fossil fuels and renewable energy specialists. The organisation is not yet in a position to put forward definitive views on the future of energy. Never-the-less, there are a number of general issues relevant to the Committee's Inquiry that should be raised.

CONTEXT FOR FURTHER RESEARCH INTO SEQUESTRATION

All carbon dioxide mitigation and reduction strategies are the business end of deliberations which associate climate change with the accumulation of carbon dioxide and other greenhouse gases in the atmosphere. *Engineers Australia* considers that there is adequate evidence to support current scientific theories on climate change. This is a position shared by all Australian government and is articulated in the COAG collaborative action plan on climate change[2].

Australia's comparative advantage in coal underpins reliance on coal fired stationary electricity. Inexpensive electricity prices have been an important driver of Australian economic development and an advantage not to be trifled with. Irrespective of their source, all credible analyses of future electricity supplies see a significant role for fossil fuels. The proportion recommended typically depends on the viewpoint of the author.

As the climate change action plan states "early action by all nations is needed to make the task of stabilising and then reducing the level of greenhouse gas emissions in the atmosphere easier and less costly to achieve."[3] The plan goes on to say that "for the sake of our future economy, as well as our future environment, Australia needs to significantly accelerate our conversion to the low emission practices and technologies of the future."[4]

There is an important need to distinguish between the timing of actions and the associated processes to reduce emissions and when formal international protocols come into being. To pre-empt international agreements could impose economic costs on Australia. However, greenhouse gas reduction options are typically at early development stages, will take considerable time to implement and are unlikely to be

amenable to stop-start implementation. It is essential that Australia is well prepared to proceed with greenhouse reduction options, including carbon sequestration, ahead of the conclusion of international agreement.

There is a considerable research effort being applied to the so called “clean coal technologies” and *Engineers Australia* supports this work. However, *Engineers Australia* draws attention to the experience of the energy efficiency and renewable energy sectors 15 years ago. Responding to market signals many professionals, including engineers, invested heavily in building the capacity needed to participate in these developments. Government support waned and this capacity was decimated. The ability to do the work is still there, but it is no longer a core function. This mistake needs to be avoided in greenhouse reductions research and implementation programs.

Engineers Australia considers there are no magic bullets for greenhouse gas reductions. What is necessary is a diversified, risk managed approach one element of which is carbon sequestration. Early discussions of the possible reductions in greenhouse gases which may figure in future international agreements are relatively high, certainly much higher than the Australian Kyoto target. The strategy used to achieve the latter was to accumulate reductions from many program and sources to mitigate risk and to spread the load. *Engineers Australia* commends this approach for future greenhouse gas reduction programs. Sequestration research and development efforts should proceed on this basis and be assured of continued long term support to avoid the disruptions that have impeded the energy efficiency and renewable energy sectors.

CAPTURE AND PURIFICATION OF CO2

There is significant continuing research into ways to reduce the costs of CO2 capture and purification. Current experience suggests the economics work when capture and purification is associated with the extraction of liquid natural gas. However, when applied to stationary power generations the costs are very high.

Reported costs are high irrespective of power station technology. The least expensive capture technology appears to be pre-combustion with costs of over $US20 per tonne of CO2 avoided. This technology includes integrated gasified combined cycle (IGCC) coal fired power stations. There are no power stations in Australia using this technology. Costs for post-combustion capture of CO2, which potentially could be retro-fitted to existing power stations, are much higher at over $US30 per tonne of CO2 captured. These figures show the enormity and importance of the task. Australians have reacted badly to rising petrol prices and can be expected to see rising electricity prices in the same light.

Engineers Australia believes that current research efforts may need to be strengthened to build upon current progress and to ensure that costs are minimised for Australians and that the country can derive the benefits of making these technologies available to other countries.

SEQUESTRATION AND CARBON TRANSPORT

The three sites that have been identified as suitable for carbon dioxide sequestration and that are being analysed in detail are the Otway Basin, the Perth Basin and the Bowen-Surat Basin. The cost of sequestratration itself is not expected to be unduly high. However, the identified sequestration sites are same distance removed from where most of the NSW power plants are located. In these circumstances carbon dioxide will need to be transported from source to sequestration site.

There is an urgent need for research into the infrastructure requirements and costs of transport arrangements. Technology is not the issue here, rather the conventional factors governing infrastructure investment will be the key issues. Investors will need assurances that the sequestration basin the infrastructure will service has sufficient capacity over the economic life of the infrastructure. This highlights the importance and urgency of research into potential sequestration sites and this work becoming available to investors.

Investors will also need a thorough understanding of the risks they are expected to bear. In particular, responsibility for CO2 leaks will need to be determined and suitable regulations and/or legislation enacted. Risks at several points will need to be covered off. There will be risks at carbon capture and compression stage, during transport, during sequestration into the chosen aquifer and for the duration of storage in the aquifer. The Australian government will need to accept responsibility for some elements of these risks without erecting unnecessary constraints to the anticipated roles of power generators and transport infrastructure owners. There is a need for research to examine in greater detail the nature of these risks, their duration, who should bear responsibility for them and associated regulatory models.

ENVIRONMENTAL AND ECONOMIC BENEFITS

Current research suggests that even assuming that the level of greenhouse gases in the atmosphere is held at existing levels, global warming will continue.[5] Reversal of global warming will require more drastic action. These processes are relatively long term but impacts are already being felt in Australia and elsewhere. Consider the impact of climate induced rainfall and runoff reductions for Perth's water supplies.[6] This phenomenon is now widely agreed and the costs are reflected in the water strategies necessary to enable Perth to adapt to the new situation. Further climate change could make the situation worse.

There are similar impacts throughout Australia, although some situations continue to be thought of the worst drought on record. The cost of adaptation to climate circumstances will be met by governments, water providers and by individuals. Following the COAG decision referred to earlier, additional work is underway to better understand these issues. The key lesson here is about the distribution of costs and benefits resulting from an uncosted externality in one industry. In dealing with future policy this issue will need to be given the same prominence as cheap power.

Evaluation of the benefits of sequestration against this background depends on views about the importance of protecting the interests of future generations. Sustainable development aims to do this. It is too often forgotten that mainstream economics was used to develop the models that underscore sustainability principles such as the precautionary principle and the irreversibility principle.[7] What differentiates the economics of sustainable development from short term concepts of economic efficiency is the time interval used as the basis for policy development. Carbon sequestration and climate change are long term issues and require more than the application of first year economics.

SKILLS FOR THE FUTURE

Engineers Australia has been arguing for some time that professional engineering skill shortages are a major problem for the future course of the Australian economy. Many of the tasks to be completed for successful carbon sequestration will require experienced professional engineers. Australian universities are not producing sufficient numbers of young Bachelor graduates. This is the entry level to professional engineering in Australia. In these circumstances the policy has been to rely on recruiting migrants with suitable qualifications.

All prospective migrant engineers, except for employer nomination program entrants, must have their professional qualifications assessed in an arrangement undertaken by *Engineers Australia* on behalf of the Department of Immigration prior to lodging applications for visas to come to Australia. Accordingly, *Engineers Australia* is not troubled by the qualifications of engineers admitted as migrants. However, *Engineers Australia* believes that there is now undue reliance on overseas engineers. As development proceeds in other economies there will be much greater competition for migrant engineers with the result that this source of supply will diminish and become more unreliable.

The demand for professional engineers shows no sign of abating. Yet very little has been done to improve the supply of professional engineers other than reliance on migration. The implementation of capital and technology intense undertakings like carbon sequestration depends on the availability, not just of engineers, but suitably qualified engineers in fields of specialisation relevant to the work to be undertaken.

CONCLUDING COMMENT

To date carbon sequestration has been seen simply as a technical/scientific problem. It is more than that. There are important logistical, financial, planning, regulatory and engineering issues that must be settled. Reaching a binding international agreement on greenhouse gas reduction may well take 10 years or so to achieve. This is not very long in the context of resolving these problems. The pace of development needs to accelerate on all fronts.

ENDNOTES

[1] This Submission has benefited significantly from the input of Jim Le Cornu, David Kilsby and David Hatton who are all members of Engineers Australia.
[2] COAG, 10 February 2006, www.coag.gov.au
[3] Op cit, p1
[4] Op cit
[5] B L Preston and R N Jones, Climate change impacts on Australia and the benefits of early actionto reduce global greenhouse gas emissions, A consultancy report for the Australian Business Roundtable on Climate Change, CSIRO, February 2006, p8
[6] J Gill, Securing Our Water Future in a Drying Climate, presentation to the National Water Commission by the CEO, Water Corporation, May 2006
[7] See Engineers Australia, Comments on the Productivity Commission Discussion Draft on Rural Water Use and the Environment, June 2006.