House Standing Committee on Science and Innovation: Inquiry into Geosequestration Technology.

A Submission from Eriks Velins.

The science and application of geosequestration technology in Australia, with particular reference to:

a. The science underpinning geosequestration technology;

Response.
Natural carbon dioxide fields exist in a number of countries, including Australia. Some of the fields in the USA, for example, have been developed commercially to provide carbon dioxide for enhancing the recovery of crude oil from nearby heavy crude oil fields. A natural gas production venture offshore Norway, Sleipner, has been re-injecting its extracted carbon dioxide in a saline reservoir for close to a decade. These experiences, plus the science upon which the petroleum industry itself is based, already provide some of the science which underpins geosequestration. There are gaps, however, including the understanding of the behaviour of carbon dioxide in other possible locations such as deep coal seams. The critical issue remains, however, the availability of sufficient evidence to convince those authorities which would be responsible for the issuing of the operating license that geosequestration will stand the test of time. Such evidence may require local technology demonstration facilities operating for a decade or longer.

The other aspect of geosequestration is the extraction or capture of the carbon dioxide. Commercial technology exists to do this from high carbon dioxide content natural and syngas streams, but an order of magnitude reduction in costs must be achieved to enable the extraction of carbon dioxide from dilute gas streams, namely boiler flue gases, the largest single source of emissions. Here new science and technology will be required, and commercial processes may be many years away.

Australia is fortunate that it had already established the CO2CRC charged with these two tasks.

b. The potential environmental and economic benefits and risks of such technology;

Response.
At present, and for some decades to come, most primary energy will be derived from fossil fuels. Should governments wish to reduce emissions of carbon dioxide from the use of these fossil (and also the emerging bio) fuels, then there are only three alternative strategies to adopt:
1. to improve rapidly the efficiency of application ie to reduce unit consumption,
2. to take carbon dioxide out of the system, ie geosequestration and,
3. to generate electricity in future initially from nuclear fission and subsequently nuclear fusion reactors.

Given that the energy industry operates in a partially regulated market, rising prices will ensure some efficiencies are periodically introduced, though very rapid price increases through taxation, for example, may result in a decline of economic growth and reduction in demand. Regulation is a very high cost and inefficient way of introducing change, as the imposition of non-commercial energy production via MRET has shown. New plants are much more efficient than old ones but, given the lack of construction of new plants for political or demand reasons, most of the savings must come from the existing plants, an unlikely prospect. New and significant financial incentives for the electricity industry would be required for it to upgrade or renew existing assets, which would be in conflict with governments' traditional short term priorities and therefore unlikely to take place. Hence there is limited scope for reduction of emissions via efficiency measures other than for brown coal fired power stations.

Geosequestration, particularly the stage dealing with the extraction of carbon dioxide from flue gases, is not yet technologically proven and its initial impact will be some time away. However, it offers much promise, for it is a new concept, now widely embraced internationally. It also supports the continuation of growth of two of Australia's major export industries, thermal coal and LNG and the use of coal for generation of domestic electricity.

Fission reactors have been in use for over half a century and latest designs offer even lower costs. Fortunately, it is again possible to debate this option in Australia but the outcome is not clear, for intuitively fossil fuel power generation in Australia could still be the cheaper option. It is very disappointing that Australia has not yet joined the ITER international demonstration project of nuclear fusion, the most likely long term source of very clean electricity. Thus Australia will remain in a catch up mode in this key energy area.

The Government is facing some difficult choices. A real reduction of carbon dioxide emissions will cost much money. Given that nearly 99% of the world's emissions of carbon dioxide come from outside Australia, is this the most important Australian environmental issue or should one, for example, concentrate on ensuring that Australia has adequate supplies of water, a totally local issue and within its control, but an issue which could be even more expensive? How can one make that choice?

The least cost approach is always the market based approach, ie carbon trading in this case, for this can enable the establishment of market based sequestration and efficiency improvement prices, thus giving the emitter a financial and technical option and the developer a realistic cost target. The EU has established such a carbon market though its ceilings are so high and hence the price so low that no incentive is provided to reduce emissions, or develop alternative options, and so far the exercise has been fruitless. Furthermore, it is my understanding that not one of the signatories to the Kyoto Protocol have put in place the measures which will result in a country actually achieving its agreed target. Another pointless exercise?

What are the technology risks?

Geosequestration technology has a number of manageable risks:

1. that it will take longer to obtain regulatory approval for geosequestration than presently anticipated,
2. that cost effective carbon dioxide capture technology will remain elusive,

3. that it will not be possible to establish a market based price for the reduction of carbon dioxide emissions vis a vis efficiency measures,
4. that most countries will continue to treat anthropological emissions of carbon dioxide with indifference and hence there will be no need to spend money to reduce Australia's emissions, for they will make zero difference to Australia's climate,
5. that the possible peaking of global oil production within the next decade or two will rapidly reduce the availability of one major source of carbon dioxide emissions,
6. that there is a chance that as of yet not conceived superior technology emerges in some other country and,
7. that it will take too long to establish the basic legislative and administrative framework.

This would lead to the possibility that the Government could be left only with developing a climate change adaptation strategy for Australia, which could well be the subject for another Inquiry.

c. The skill base in Australia to advance the science of geosequestration technology;

Response.
The research of geosequestration in Australia was initiated almost a decade ago through a project named GEODISC, managed by the APCRC. At that time there were no skills in this area, indeed, there were almost none anywhere in the world. The GEODISC programme created those skills, which were then transferred to the CO2CRC, now on a much larger and internationally collaborative basis. Thus this is a leading edge, world class research programme and, appropriate skills will be developed as it proceeds to a successful conclusion, but it may not yet be quite clear as to what those additional skills will need to be. Furthermore, one should look at resourcing in its global and not only Australian context.

d. Regulatory and approval issues governing geosequestration technology and trials: and

Response.
It is quite possible that the critical path for implementation of this technology leads through regulatory and approval issues, given that it is very new technology. Hence this path must be reduced as much as possible in order that this technology has the possibility of actually making a contribution.

Manageable risks for approval of the technology include:
1. those related to the ownership of the carbon dioxide, for this would be measured in geological time scales rather than political,
2. the operation of the facility and the treatment of liability should there be leakage,
3. the incorporation of this technology in international protocols and possible resistance by some countries to it,
4. the adequacy in terms of capacity and time of demonstration facilities,
5. the time taken to establish a carbon market and its ceilings, ie the appropriate targeted reductions,
6. the overall financial measures to compensate for these new and potentially non-competitive cost imposts,

7. the treatment of patents and intellectual property and,
8. the role of royalties in a possible subsequent use of these carbon dioxide resources.

e. How best to position Australian industry to capture possible market applications.

Response.
The CO2CRC has been so established as to include many of the key industry players, national and international, who, no doubt, will take full advantage of all commercial opportunities which this programme will create, given that they have made such large contributions to this programme.

The role of Australian industry will largely depend upon how many facilities would actually be built, ie whether this technology will be applied to existing and new facilities on a commercial or regulatory basis and whether that would provide the necessary base to expand into overseas markets. One would suspect that the international process companies would pick up the license to manufacture and install the equipment, which would then leave Australia largely with the consulting and servicing capability.

Conclusion.

There are presently three options for managing the emissions of carbon dioxide. Geosequestration technology offers the only potentially significant cost effective option. though it will require some time to become commercial. Australia has already put in place an organisation, the CO2CRC, to manage the process. All governments now need to give it long term support and resources for success.

28th July, 2006