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The Secretary,
House of Representatives Standing Committee on Science and Innovation,
PO Box 6021
Parliament House ACT 2600

Email: scin.reps@aph.gov.au

Dear Dr Dacre

Inquiry into the science and application of geosequestration technology

Credentials

The National Generators Forum (NGF) is an industry body which directly represents the 21 major power generators in the National Electricity Market. Verve Energy in Western Australia is an Associate Member.

The installed capacity of the members is 44,129 MW in 2006, with an asset value of over $40 billion. Annual sales are over 180,000 GWh, having a value of about $5,500 million. This is over 95% of the total Australian market.

The NGF focus is on cost-competitive electricity generation, irrespective of the fuel source or technology. This has led to some of the lowest electricity prices in the world, which, in turn, has provided Australia with a major competitive advantage particularly in relation to value-adding to our enormous resources.

The NGF has significant involvement in issues related to greenhouse response in Australia. It represents electricity generators on a number of Australian Greenhouse Office committees and working groups, is represented at the Asia – Pacific Partnership on Clean Development and Climate, and engages with its large customer industries through the Australian Industry Greenhouse Network.

On a related issue, the NGF has also lodged a submission to the Uranium Mining, Processing and Nuclear Energy Review.

Policy work being undertaken

The NGF is in the process of completing a major study on electricity generation and greenhouse response under the auspices of its Greenhouse Working Group (representing all electricity generators) with consultants CRA International. A key part of the study is an examination of new low emission electricity generation technologies and related opportunities (and costs) of carbon capture and storage. The NGF is willing to share the outcomes from the study with the Standing Committee as soon as the documentation is finalised. The NGF would welcome the opportunity to appear before appropriate hearings of the Committee.

A key finding of the NGF's comprehensive study is that deep cuts in greenhouse gas emissions, defined as a 50% reduction by 2050 from electricity generation, will require a range of technologies. These include advanced pulverised fuel combustion, new low emission technologies with or without carbon capture and storage (CCS) - such as integrated gasification combined cycle combustion, renewables-based generation and, potentially, nuclear power. Eliminating the use of any of these technologies will make the achievement of deep cuts in emissions much more difficult and production costs will rise significantly.

In particular, the NGF study examined two scenarios for achieving the 50% reduction in emissions by 2050 – one with and one without nuclear energy. Both scenarios call on advanced fossil fuel generation, including carbon capture and storage, but the 'without nuclear' scenario requires significantly more new fossil fuel technology with carbon capture at significantly increased cost.

As part of the study, the sensitivity of the output to variances in costs of the different technology was examined. These sensitivity assessments show significant challenges faced by most new technologies.

Within the study, a conservative limit on the amount of available sequestration capacity was assumed. We decided to use the assumption that up to one half of the 'unconstrained' emissions could be captured and stored. As an indication, this means a linear increase from 2020 to 180 million tonnes per year in 2050. This was based on the early work done by the Cooperative Research Centre for Carbon Abatement Technologies (CO2CRC), and acknowledges that not all potential reservoirs will be viable when examined in detail and tested during the exploration phase.

Results of policy work

In brief, the key points coming out of the NGF study are:

- There is a strong need for research, development, demonstration and commercialisation of low emission technologies and carbon capture and storage technologies. Governments should not attempt to pick technology winners but facilitate RDD&C for all prospective technologies on a commercial basis.
- Low emission technologies with carbon capture and storage would not feature if there are no constraints on greenhouse gas emissions.

- In a carbon constrained world, total production costs would increase due to the higher capital and operating cost of lower or zero emitting technologies.
- The potential rate of deployment of new technologies is currently unknown, although it will be impacted on by demand growth, regulatory and market frameworks and greenhouse policy direction.
- Most states have not been well explored for sequestration sites. Much more geological work is needed in all states to prove storage sites.
- NGF and NGF members fully support the COAL21 program focussing on all low emission fossil fuel technologies. Electricity generators are, and will need to continue to be, pro-actively engaged in making low emission technologies economically viable.

The Geosequestration Reference Group

The NGF was a key member of the Carbon Dioxide Geosequestration Regulatory Reference Group set up by the Carbon Dioxide Geosequestration Regulatory Working Group of the Ministerial Council on Mineral and Petroleum Resources, chaired by Western Australia and supported by the Department of Industry, Tourism and Resources.

The Reference Group played a key role in developing the regulatory principles and guidelines for geosequestration in Australia, culminating in the report titled '*Carbon Dioxide Capture and Geological Storage – Australian Regulatory Guiding Principles*'. The report and guiding principles were subsequently adopted by the MCMPR and supported by the Ministerial Council on Energy.

Many of the issues that are subject to the Standing Committee's inquiry were addressed by technical experts at the Reference Group meetings resulting in wide-spread 'sign-off' of the guiding principles by a diverse group of stakeholders. The Standing Committee is urged to examine the technical and other information used during these deliberations and review in detail the guiding principles report adopted by all Governments.

Some aspects of the report pertinent to electricity generation are elaborated upon in brief in this submission.

The science underpinning geosequestration technology

Geoscience Australia, the CO2CRC and extensive international work is advancing the science that underpins carbon capture and storage technology. This technology is based in the oil and gas industry where enhanced oil recovery technology and re-injection of 'gassy' oil and gas by-products are well-established processes globally. Australia is endowed with a range of geological formations potentially suitable for the storage of large volumes of carbon dioxide. While acknowledging that there is more work to be done in assessing the storage capacity in Australia, the preliminary work to date is positive.

The proving up of injection and storage technologies in geological formations, such as deep saline aquifers, exhausted oil and gas reservoirs and 'unwinable' coal seams is now also needed in order to give industry confidence that sufficient capacity is

available for the medium to long term. This work differs from the preliminary work done by the CO2CRC and is more akin to an oil and gas exploration program, inclusive of drilling, and scientific assessment.

There is also potential to use the CO_2 to enhance coal seam methane production in conjunction with sequestration. Australia has both the potential storage basins and technological expertise to advance these storage opportunities and Governments should encourage and coordinate a national approach to proving up reserves and storage technologies.

The potential environmental and economic benefits and risks of such technology

The NGF has no direct expertise in assessing the risks associated with geosequestration technology but close association with the relevant experts and the involvement of NGF members in storage activities would indicate that the environmental and safety risks associated with storage activities are low. This is particularly the case when injection, injection point capping and monitoring are well planned and managed. NGF would support the establishment of national or state-based bodies to deal with these issues in a consistent and cost-effective manner.

The environmental and safety risks associated with carbon dioxide capture, treatment, transport and geological storage are little different from those associated with production and transport of products from the oil and gas industry. Carbon dioxide is in many ways a very inert and un-reactive substance. With the development of appropriate management tools, such as codes of practice and risk assessment procedures, risk are easily manageable.

Technologies such as oxy-firing and ultra-super-critical combustion with post combustion capture of carbon dioxide, and integrated gasification combined cycle combustion with carbon capture and storage, require large amounts of capital to deliver an integrated and workable power plant capable of delivering cost-effective electricity to Australian consumers. It is critical for Australia to retain its competitive advantage in competitively priced electricity for the value-adding to our resources and our manufacturing sector.

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

Power station operations require a highly trained and skilled workforce and additional plant activities related to carbon dioxide capture, treatment and transport for final disposal would be readily accommodated within the operating regime of thermal power stations.

The Australian oil and gas industry already has the expertise in pipeline management and operations and in well-head technologies. It would be a small step to train an Australian workforce in transport and storage operations. Long-term monitoring of geological storage facilities is an area where both the science and the industry practice need to develop. Demonstration plants are important to facilitate this development.

Regulatory and approval issues governing geosequestration technology and trials

The NGF believes that the regulatory framework and guidelines approved by the MCMPR provide a good starting point for the development of the necessary regulatory processes governing geosequestration technology and trials.

It is important that the regulatory framework and approval processes are designed to expedite the deployment of geosequestration technologies and thereby minimise costs to proponents and consumers as geosequestration must play a vital part in reducing global carbon dioxide emissions.

How to best position Australian industry to capture possible market applications

A multi-faceted approach involving the Federal and State Governments is needed to best position Australian industry to capture essential market applications and opportunities both in Australia and internationally. Current activities involving state and federal programs provide a good start, such as sequestration trials supported in Victoria, Western Australia and, potentially, Queensland through funds such as the Low Emission Technology Demonstration Fund and related state-based funds.

But much more is needed if Australia is to move from a comparatively high emission economy (at least in per capita terms) to a low greenhouse gas emission nation still capable of using and exporting its enormous fossil fuel resources whilst reducing emissions.

A nationally coordinated approach is proposed to deal with all aspects of technology development from combustion technology capable of concentrating carbon dioxide emissions, to capture, treatment, transport and geological storage technology. This may involve the establishment of a national body, fully supported by the Federal and State Governments and industry that can coordinate the range of technologies needed to make widespread geosequestration a technical and political reality.

This approach could be taken further. State governments could provide a common collection and disposal infrastructure for carbon dioxide in the same way that disposal facilities are provided for city waste. It is most likely that sequestration will be most economic when it is undertaken for a number of generators in an area which could be connected by pipelines leading to the disposal site.

It appears that this is what the United States Government has in mind at its zero-emission FutureGen project, at least for the first single CCS plant. The US Government is requesting states to offer the development of as storage site in return for being selected to host the FutureGen plant.

Conclusion

The National Generators Forum regards the development and application of geosequestration as extremely important for Australia. We are endowed with plentiful coal resources from which we generate cheap energy. But there is increasing concern about emissions of carbon dioxide into the atmosphere.

It is critical that the nation gain a much better appreciation of the availability and cost of geosequestration. A good technical understanding is first required. There should then be a strategic examination of how the community may provide a facility for those industries which emit carbon dioxide. The emissions need to be collected in a cost-effective manner for the benefit of the environment and our society.

Once finalised, I would confirm that the NGF is willing to share its knowledge gained from the current study on low emission technologies capable of carbon dioxide capture and storage and their potential place in the National Electricity Market. We would seek your advice on how this can best be done.

Yours faithfully,

John Boshier
Executive Director