Submission to the Parliament of Australia

House of Representatives

Standing Committee on Science and Innovation

Inquiry into Geosequestration

Friends of the Earth Australia

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Prepared by Kim Stewart

BA. BSc. (hons A)

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Executive Summary

- Geosequestration is an expensive, unproven and potentially dangerous solution to CO2 emissions that does not deal with the source of the problem. It will only, at best, provide a 8% reduction in emissions from *electricity production* by 2020, which is no reduction on 1990 levels of emissions, and may not become useful until 2015

- Geosequestration does not address the other ill effects of coal mining and coal use

- The storage phase of geosequestration unfairly confers the expense of monitoring and safety to future generations

- There is no legal structure to ensure corporate responsibility and liability for the effects of the technology

- Investing public money in geosequestration deprives other more worthy and proven technologies of public funds

- Committing Australia to geosequestration is committing us to a future of more, not less, coal use

- It is socially, environmentally and economically more responsible to invest in proven technologies to address climate change.

1. Introduction

It behooves us to take quick action on climate change. It is already affecting peoples lives and economies globally and locally. While it might be preferable to do this without cost to current industries, some dinosaurs must die for the world to evolve, and coal mining is one of them.

In a ideal world, FoEA would love to see a technology that could harmlessly and at profit remove carbon emissions from the atmosphere and make coal truly 'clean'. But in fact coal is never clean, despite the claims of the technology. From mining to the end use and production of emissions, the coal process is dirty and its costs to health, environment and global climate are not factored into the cheapness of Australian coal.

Geosequestration is an attempt to make coal cleaner, yes, but it is not the panacea coal enthusiasts would have us believe. Geosequestration in Australia will come at great cost to the taxpayer, great cost to the renewables sector, and risk to the environment. Those costs and risks will extend to many hundreds of future generations of Australians. At the same time it is depriving existing renewable technologies of public money. It is unlikely to become a useful technology before 2015, and proper waste management may not be determined for decades.

Choosing geosequestration and its associated 'clean coal' technologies is committing Australia to a emissions heavy coal-reliant future. It will mean further financial commitment to fossil fuels and the infrastructure that supports them at the cost of cleaner and less costly renewable energy choices.Renewable energy, energy efficiency and demand management remain the fastest, safest, most cost effective, environmentally and socially responsible ways to reduce greenhouse gas emissions. These technologies already exist, are proven, and could put Australia at the forefront of curbing greenhouse emissions.

Geosequestration is an end-of-pipe solution that does not deal with primary causes of climate change: the gross overconsumption of fossil fuels by the minority world. Australia's first place in the per capita emission stakes indicates how severely unsustainable our lifestyles, industry and economic systems are. A primary response to creating climate justice is consuming less. We don't need to suffer to do this, but industries and governments must take responsibility for efficiency and alternatives, rather than relying on technological fixes that will further our dependence on fossil fuels.

As such, this submission will dwell on the social and environmental aspects of the technology in question, but will attempt to address the other Terms of Reference.

FoEA see geosequestration as one of a raft of new technologies being promoted under the 'clean coal' banner. As such, we do not see it as an isolated case, as it relies on the success (and expenditure in) other technologies including coal gasification, oxy-fuel combustion, and the building of advanced or Integrated Gasification Combined Cycle(IGCC) coal and gas based power plants.

It is also part of the wider coal-based energy provision paradigm so should be considered in conjunction with the environmental and social effects of continued coal mining, coal-fired power, and the future of Australia's energy based if it is to be based on deplete-able and environmentally damaging resources. It should also be considered in context with the wider global issues of energy, social justice and climate change.

2. Addressing the Terms of Reference:

2.1. FoEA's comments on the science of geosequestration

While a great deal of work has now been done to demonstrate the possibility of capturing carbon either from gas prior to combustion or post-combustion from flue gases, less has been said about applying the technology, or what technology will secure the sequestered carbon.

2.1.1 only new power plants

On the first point, even the pro-coal World Coal Institute say it is not economically viable to retrofit current

coal-fired power stations for capturing carbon. This leaves all current coal-fired power plants emitting as much greenhouse gases as they ever have. Only *new* coal-fired power plants can be fitted with carbon sequestering filters and they will both cost more and have to produce more electricity than current plants due to the energy required to sequester carbon.

In addition, carbon sequestration technology does nothing to reduce the other dangerous emissions from coal-fired power plants including sulphur dioxide (SO2), nitrogen oxide, arsenic, mercury, dioxins, cadmium, radionucleotides and lead. SO2 is the precursor to acid rain, while the others are linked to cancer in humans. A study by Schneider (2000) estimated that particulate pollution from US power plants cuts short the lives of more than 30,000 people a year. Coal-fired power is the largest single source of atmospheric mercury emissions and no technologies are available to eliminate mercury emissions from power plants. Removing carbon emissions from the burning of coal does not make it 'clean'.

2.1.2 transport issues

Pipelines have been suggested as a means of moving liquid CO2 from power plants to the geosequestration site. Pipelines have been used to transport oil in many countries with mixed results. Environmental Rights Action Nigeria estimate as many as 300 pipeline leaks and bursts occur there every year.

The International Energy Agency estimate that transport of CO2 to storage sites could add US$5/tCO2 to the cost of capture and storage (IEA 2004:17).

2.1.3 storage issues

Oil fields, Gas fields, saline formations, and unminable coal seams have been suggested as storage sites. No generalisations about the security or risks associated with storage sites can be made due to the geological uniqueness of each potential storage site. However, there are problems in common with them.

The main problem is the possibility of leakage, either slowly, over a long time, or in a catastrophic rush. In the latter case it may result in local deaths, as air with 25% CO2 will displace regular air and hence suffocate local humans and animal life. In the former case, slow leakage can still kill, at levels of just 7% CO2. Leakage will also undo the work of sequestration, and increase CO2 emissions, or it may leak into water, increasing its acidity. The Intergovernmental Panel on climate Changes estimates the risk of leakage to be minimal, even if pipelines were used to transport the liquefied CO2 to the storage site.

The storage of liquid CO2 is not the same as the oil or coal it will replace in the mine site chosen for storage, as it requires compression to retain its liquid state. In addition it needs to be monitored for stability. It is our understanding that this will be done using siesmic devices which may destabilise the deposit.

Where CO2 will be injected into oil, gas or coal fields (enhanced recovery) it will displace and allow more extraction of the fossil fuel that is the source of GHG emissions, and hence aids profit, not climate.

Where CO2 is injected into underground saline aquifers problems have developed. A recent pilot project in Texas has found that sequestration has made aquifer water more acidic and as a consequence the rock holding the CO2 in place is dissolving. The majority of geological sequestration locations are based in saline aquifers, some operating since the 70s as Enhance Oil Recovery projects (IPCC 2005: 30).

In Western Australia a proposed sequestration project under Barrow Island was rejected by the state government for environmental reasons. The WA Environmental Protection Authority says it has rejected the proposal on the grounds it would adversely effect populations of marine and land flora and fauna, particularly flat back turtles. The Gorgon project proposed by Chevron, ExxonMobil, and Shell was to combine IGCC power plant with gas extraction and geosequestration into a saline aquifer under the island.

When the International Panel on Climate Change made their 2005 assessment that 99% of carbon sequestered in geological formations would remain trapped for a thousand years, the development of leaks causing rock disintergration such as that found in Texas study, had not been expected. Nor did they make any assessment of the seismic testing of deposits, or seismic activity of any kind, on the stability of the storage site in their

seven scenarios of possible leak accidents (IPCC 2005:32). The IPCC do say that there needs to be an upper limit of acceptable leakage to make the technology viable.

In respect to storage of sequestered CO2 it is the opinion of FoEA that many of the same difficulties will arise as those of storing nuclear waste: regular monitoring is necessary, the time frame of this monitoring extends into the hundreds of thousands of years and a leak or release has the potential to cause damage to the environment by increasing climate change, or causing deaths to humans and animals in the locality. Like radioactive waste storage, these things have not been proven possible in advance. Will we end up with warehouses full of unsecured liquid CO2 with no safe place to store it in 50 years time, as we have with radioactive waste?

2.2 FoEA's comments on the economic and environmental pros and cons of geosequestration

2.2.1 a climate change success story?

The Australian government is investing in and promoting geosequestration as a technology to mitigate climate change. The extent to which this is true has been questioned. Dr Ben McNeil, research fellow at the Centre for Environmental Modelling and Prediction at the University of New South Wales, makes an estimate based on the government's own assessment of our future electricity needs that our current power plants will still be providing ninety five per cent of our electricity needs by 2010 and seventy five per cent by 2020. Mc Neil says,

> Given that geosequestration is only economically feasible only for new electricity generation plants, this means that only 3 percent of our electricity needs can use this technology by 2010 and only 25 per cent by 2020. And since the electricity sector contributes only a third of our overall greenhouse gas emissions, geosequestration could only reduce the total by at best 1 per cent by 2010, 8 percent by 2020. So even if we take that path, rising energy demands mean that by 2020 Australia's emissions will still be at least about 118 per cent of 1990 levels" McNeil 2004)

McNeil estimates are based on a scenario where plants are able to sequester 100% of their carbon emissions. To date the best estimate is that new plants will be able to sequester between 85-90% of their CO2 emissions. With geosequestration only a possibility for new power plants, and little need for new power plants by these estimates, the CO2 reduction impact can only be expected to be small.

Saddler, Diesendorf, & Denniss' peer reviewed *Clean Energy Future for Australia* 2005 shows it is entirely possible to phase out coal by increasing renewables like wind and geothermal and increasing efficiency. Their research shows that it is possible

> to achieve a 50% reduction in CO2 emissions from stationary energy by 2040, by using a mix of existing technologies, with small improvements, in order to produce and use energy more efficiently and more cleanly. So, in our principal scenarios there are no dramatic breakthroughs in technologies: no cheap electricity from solar photovoltaic cells; no cheap capture and sequestration underground of CO2 emitted by coal-fired power stations; and no cheap methods of producing hydrogen as a means of storing and transporting renewable energy (2005: 12)

2.2.2 coal mining

The International Energy Agency says that carbon capture and sequestration "would result in a significant increase in the use of coal" (2004: 19).

Geosequestration of carbon from power plants would not be necessary but for coal mining. In considering geosequestration as a policy direction for Australia we are committing to future coal expansion. Coal strip mining has rendered vast tracts of the Hunter Valley into a moonscape, while releasing other toxins including selenium and arsenic into the environment. Acid Drainage is an ongoing concern in coal mining regions where mine tunnels provide increased avenues for acid contaminated water to leak into groundwater. In the Hunter Valley dust storms of coal particulates pose a health risk to residents nearby.

2.2.3 more costly electricity, cost to future generations

Due to the need to build entirely new coal-fired power plants to capture carbon, the increased energy needs to sequester carbon, and the costs of stage of sequestered carbon, it is highly likely that electricity will increase in cost to the consumer as a result. Studies by MacGill and Outhred (2003), Tarlo (2003) and the International Energy Agency (2004:18) indicate that geosequestration will cost between $46 - $140/tCO2 and will require between 10 and 40 % of plant energy production to do it. These estimates call into question the Federal Government's overly optimistic estimate of $10/tCO2. Tarlo estimates that a power plant using pulverized coal with carbon capture technology will cost as much as 90% more.

Carbon storage will require the same kind of technology used for mining and drilling for oil and gas. In recent months the test project in Victoria's Latrobe Basin has experienced a cost blow out due to rising oil prices by two thirds to $3 billion as a result of increased demand for oil drilling equipment. This is another cost not factored into much of the literature that estimates the cost of CO2 geosequestration and could considerably increase the economic failure of the technology.

Although this inquiry is allowing public input, on the ground public consultation is inadequate. In January 2006 the ABC reported that the Otway Basin under Warrnambool had been chosen as the first site for geosequestration. However Peter Johnston, the chief executive officer for the Corangamite Shire told the ABC that, "Council hasn't been informed in any way at all, and we'd be expecting that we would be perhaps informed in relation to what being proposed, and timelines in the near future, but at this time we're not aware of anything particularly in our municipality." Indeed, the final report on the project devotes just two lines to their community engagement plan (Hooper 2005: 27).

2.3 FoEA's comments on regulatory issues

All geosequestration projects will have a predetermined life based on the storage potential of each site. During that time the responsibility for the project lies with the corporation undertaking it. Once the project is over, say in 40 years time, the care of the site, including the upkeep and cost of any accident, is turned over to the state.

FoEA consider this development an unfair burden on future generations who neither choose the technology nor benefit from it financially. Full economic, environmental and social costs and legal liability should lie with the corporations producing and sequestering the emissions, not with taxpayers or future generations. Only full liability will determine fair market success or 'capture' by the technology.

2.4 FoEA's comments on market capture

Geosequestration remains cost prohibitive, it will not be taken up by the market voluntarily without government subsidies.

The coal industry already receives million of dollars in indirect subsidies and subsides to geosequestration will be subsidies to the coal industry. In recent years geosequestration has received the lion's share of Federal MRET funding, and coal industry projects will get $75m through the Asia Pacific Partnership,the $500m Low Emissions Technology Demonstration Fund is set to deliver more money to the coal industry for new untested technologies like 'coal drying' while Queensland has just committed another $300m to more coal research while Federal tax breaks have stimulated more, not less, oil and gas exploration. This is clearly not a level playing field for renewables, who received about $15m from the Federal govt this year. It does not demonstrate a commitment to reducing fossil fuel consumption necessary to reduce GHG emissions.

If market capture is the driving force behind this inquiry, then geosequestration should be avoided in favour of renewables. Wind power has shown 30% growth every year for the last decade, while becoming more affordable. The photovoltaic industry has grown 30-40% over the last decade and the solar hot water industry has grown by 30% a year in recent years.

3. Recommendations:

A Geosequestration potential of 8% by 2020 at best does not represent a large enough reduction in GHG emissions to effect the large reductions necessary to alleviate climate change.

FoEA's recommendations are based on the assumption that geosequestration is principally to be employed for emissions reduction, rather than profit.

- FoEA recommends a raft of approaches including diversifying the energy sector to include renewables and demand reduction through efficiency before more expensive, risky and unproven technologies such as geosequestration be promoted;

- FoEA recommends the full cost and legal liability of research and geosequestration projects should be borne by the fossil fuel industry, not taxpayers of today or the future. A stringent legal framework for ensuring this must be put in place before projects go ahead;

- FoEA recommends full public consultation, risk assessment, and emergency plans be done for each potential project site before commencement;

- FoEA recommends that if the above commitments to accountability and legal responsibility are not met by the pertinent corporation, the state abandon geosequestration as a object for public investment or tool for GHG emission reduction and put a moratorium on all future projects until the liability issues can be resolved. Not to do so leaves too great a burden on future generations;

- FoEA recommends that if the committee decides geosequestration projects are to go ahead with public funding, then equal funding should be invested in renewable alternatives as well. Many renewables are proven technologies and have a market growth rates that give them market viability that 'clean coal' technologies do not. Renewables investment can also help Australia deliver climate justice to impoverished nations, helping them jump the 'technology gap' by avoiding the industrialisation that fossil fuel dependent nations require.

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