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Title: Effectively Promoting Greenhouse Gas Storage in Australia

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Abstract:

The underground storage of greenhouse gases is seen by many as one of the primary technologies by which fossil fuel dependant nations can reduce their greenhouse gas emissions. Consequently there is a societal need to consider how best to facilitate the commercial scale uptake of this technology.

Two principal barriers remain to the commercial scale deployment of greenhouse gas storage. Existing capture technologies are currently very expensive and there remains community concern that the underground storage of greenhouse gases is permanent.

It is likely that the natural gas industry will continue to be world leaders in the commercial scale deployment of greenhouse gas storage as this industry already captures large volumes of carbon dioxide and is familiar with underground storage technologies. Over time, increased commercial scale deployment by the natural gas industry will build community confidence in the technology thereby facilitating deployment by other industry sectors.

Opportunities to promote greenhouse gas storage in Australia need to be considered in the broader policy context, which should be to reduce Australia's greenhouse gas emissions at the lowest possible cost to the community. This paper reviews the various ways in which greenhouse gas storage can be promoted and tests these in light of this broader policy context. The paper identifies those opportunities that should be pursued to promote the commercial scale uptake of greenhouse gas storage and flags those opportunities that while they might assist in the uptake are incompatible with the broader policy objective.

Paper:

There has been much written over the last few years about the role that underground storage of greenhouse gases can play in reducing global greenhouse gas emissions. There has also been much written about how best to facilitate the wide scale uptake of greenhouse gas storage technologies with much of the focus on the need for continued research and development; the development of clear regulatory frameworks; the need to build community acceptance; and the need for various forms of financial assistance or some other form of government support program.

While all these issues are important, what is often missing from the discussion around greenhouse gas storage is how this opportunity integrates with the broader policy environment around how to address the risks posed by climate change.

Greenhouse Gas Storage in the Broader Policy Context

In considering the role that greenhouse gas storage can play as part of an integrated response to climate change, the first issue that must be addressed is to distinguish between the objective of driving the wide scale deployment of reducing greenhouse emissions at the lowest possible cost across the economy. Only after this issue has been addressed can the options around how best to promote greenhouse gas storage technology be considered.

The prosperity and improved living standards that much of the world has experienced over the last 200 years has been as a result of our ability to harness low cost energy provided by fossil fuels but this has not been without a cost to the environment. Most recently this has been expressed in relation to the contribution to global climate change. Greenhouse gas storage technologies are being considered to allow the continued use of these relatively low cost energy resources but in a way that limits emissions. With the ultimate aim to minimise

the risks posed by climate change. The critical point here is that without the need to reduce greenhouse emissions there would be no need to undertake greenhouse gas storage.

This link between economic prosperity and low cost energy dictates that improved environmental outcomes must be achieved at the lowest possible cost to the community. It stands to reason therefore, that the policy objective must be to reduce emissions at the lowest possible cost to the community. This can only be delivered by government prescribing particular technology or actions where government has perfect information about the current and future economic benefits and costs between all competing low emissions technologies. It is generally recognised that governments don't have such perfect information.

Many economists argue that markets are better able to choose efficient economic outcomes than governments. This is behind the move in many jurisdictions for the introduction of emissions trading as the primary policy instrument to reduce greenhouse gas emissions. Naturally the degree to which a particular trading scheme can deliver the lowest cost outcome will depend upon the scheme design but also on the nature of the complementary climate change polices that are used to support the scheme.

Addressing Ongoing Market Failures

The Garnaut Climate Change Review[1] argued the efficient operation of the market requires little government intervention but went on to discus how gaps in the supply of information and skills may be expressed as continuing market failures. Garnaut argues that significant government funding for basic research and development of low emissions technologies which addressed these information gaps was in the international public good. However, in order for government intervention to be justified, the cost of the market failure needs to be more than the cost of government intervention, with all of its political, economic and other risks and costs.

In effect, for an emissions market to operate efficiently, government needs to make sure that the market has accurate information on a wide range of technologies from which to choose. In order to provide this information, government should support research and early demonstration of a range of technologies but should not provide support for technologies once they are suitably mature. The relationship between supply-push, market-pull and continuing market failures which could be addressed by government intervention is illustrated in Figure 1.

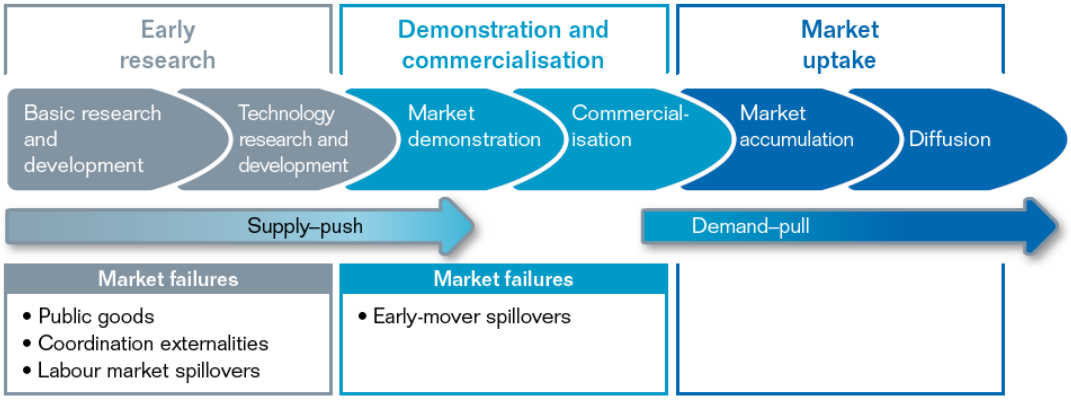

Figure 1: Market Failures along the Innovation Chain (Garnaut Climate Change Review)

Importantly Garnaut goes on to list several mistaken arguments for government intervention where there is a well designed emissions trading scheme. These include:

[1] Garnaut Climate Change Review – Final Report– Cambridge University Press - 2008

- There will not be enough innovation or time to develop new technologies for Australia to meet its national targets successfully
- The permit price will be low initially and therefore will not drive much innovation
- We need to invest in innovation to lessen the impact of the carbon constraint.

These justifications are incompatible with the efficient working of an emissions trading scheme.

Having determined that emissions reductions are most effectively achieved by market based mechanisms and that government intervention should be restricted to addressing areas of continuing market failure, consideration can be given to identifying those information gaps associated with greenhouse gas storage that might give rise to a market failure. These can be summarised as:

- Areas where technical information is incomplete such as;
    - the need for basic research into alternative capture technologies with the objective of significantly reducing capture costs
    - the recognition that many of the sedimentary basins in Australia are under explored and the storage potential is not well understood
    - The need for a sharing of knowledge and skills across all sectors wishing to undertake greenhouse gas storage
- Gaps in information available to the community to enable it to assess the efficacy of greenhouse gas storage.

Addressing Technical Information Gaps

In general, the technologies to transport, geologically store carbon dioxide and to monitor its behaviour in the subsurface are all technologies that are routinely used in the upstream oil and gas industry. While these technologies will continue to be further developed and refined over time, it is unlikely that basic research in greenhouse gas transportation and storage will satisfy Garnaut's requirement that the cost of government intervention must be less than the anticipated benefit.

In contrast the technologies to capture carbon dioxide from exhaust gases from the burning of fossil fuels are not well advanced and have yet to be deployed at large scale. It is conceivable that basic research has the potential to develop improved capture technologies that may significantly reduce the cost of capturing carbon dioxide from exhaust gases. Government intervention in the development of new capture technologies is therefore likely to be justifiable by the anticipated benefit.

Putting aside the technologies used to undertake greenhouse gas storage the application also requires a high level understanding of the geology of potential storage sites. While some Australian sedimentary basins are well understood many are only lightly explored. The lack of detailed information on many potential storage basins may represent an information gap which can be addressed through government intervention, such as the precompetitive data collection currently undertaken to support mineral or petroleum exploration. Such studies should aim to develop a sound understanding of an areas geological architecture and its storage potential prior to release for competitive bidding as a greenhouse gas exploration area.

Technology sharing is also required between industries wishing to undertake greenhouse gas storage. Much of the transportation and storage technologies are well understood but need to be shared with other sectors in the economy such as power generation. Similar technology sharing issues may also arise between developed and developing economies. Government sponsored forums such as the Global Carbon Capture and Storage Institute and the Cooperative Research Centre for Greenhouse Gas Technologies can play an important role in this regard.

Building Community Acceptance

Despite the potential environmental benefits of greenhouse gas storage, there remains opposition to its application in some sectors of the community. This opposition is directed not at the application of capture technologies, which are seen as just another part of the industrial process, but at the underground storage of carbon dioxide. Much of this can be traced to a lack of familiarity with the technologies being applied and potentially exacerbated by a general mistrust of large industry.

In part, community acceptance can be addressed by the development and implementation of robust regulatory regimes that place appropriate weight between facilitating deployment and robust regulatory oversight. This involves laws that regulate the underground storage operation as well as understanding how existing laws dealing with matters such as environmental impact assessment will be applied. The recent passage of amendments to the Commonwealth Offshore Petroleum Act and similar laws in Victoria and Queensland position Australia as a world leader in this regard.

Ultimately however, community acceptance will only come with the successful large scale demonstration of the technology. As well as demonstrating how the various components of the technology can be integrated together, these demonstration projects will assist in building community confidence that greenhouse gases can be stored permanently underground.

The gas processing industry will play a critical role in this early large scale demonstration of greenhouse gas storage both globally and in Australia. There are currently three greenhouse gas storage projects in operation around the world with each injecting between 700,000 and one million tonnes of carbon dioxide per year. In Australia, the Gorgon Project will potentially be the fourth large scale demonstration project and is significant in that it will increase the scale of injection operations to in excess of three million tonnes per year. This uptake by the gas processing industry is due to the relatively low additional costs of capturing the carbon dioxide from gas processing plants and the familiarity with the storage technology within the gas production industry.

These gas industry projects are currently playing a critical role in addressing information gaps around the communities understanding of the efficacy of the technology. In all likelihood, it will be the gas industry that will continue to lead in the large scale deployment of this technology. Government intervention to support the early deployment of greenhouse gas storage technologies should not overlook the opportunities to support early demonstration that exist in the gas processing industry.

Summary

Government intervention to promote greenhouse gas storage should be limited to:

- Basic research primarily in the area of developing new capture technologies
- Undertaking pre-completive geologic assessments of areas that may have storage potential but where significant gaps in geologic knowledge remain
- The facilitation of several large scale projects which demonstrate the integration of the various technologies and at what cost.

The gas processing industry is likely to play a critical role in the large scale demonstration of greenhouse gas storage given the low additional cost of capturing carbon dioxide in that industry. Government intervention to assist these projects has the potential to play a critical role in addressing the information gaps in the community around the efficacy of the technology.

Beyond the interventions identified above, demand-pull for the technology should be left to market based mechanisms such as well designed emissions trading schemes. The ultimate goal is to achieve a reduction in greenhouse gas emissions, at the lowest possible cost to the community.