

CCS – Where we are & Current Challenges

Introduction

Thank you for the opportunity to share with you some thoughts on this issue.

The William J. Clinton Foundation launched the Clinton Climate Initiative (CCI) to create and advance solutions to the core issues driving climate change. The model that we are applying is to work with governments and businesses around the world to tailor local solutions that are economically and environmentally sustainable, CCI focuses on three strategic program areas: increasing energy efficiency in cities, catalysing the large-scale supply of clean energy, and working to measure and value the carbon absorbed by forests. In each of these programs, CCI uses a holistic approach to address the major sources of greenhouse gas emissions and the people, policies, and practices that impact them.

The Clinton Climate Initiative strongly shares the GCCSI's objective to accelerate the worldwide development and deployment of commercial scale CCS. We have formed a partnership with the Institute in which work that we had already underway on several large-scale integrated CCS projects has been incorporated as amongst the Institute's early mover projects, whilst we are now actively combining our resources to identify and accelerate a portfolio of new projects.

Garnaut Modelling

In 2008, I worked with the Garnaut Climate Change to provide advice to the Australian Government on the appropriate economic policy response to climate change. The economic modelling that underpinned that work and focused on achieving stabilisation of global GHG concentrations at 450 and 550 ppm of Co₂e, indicated that CCS could be associated with 1/3 of the global stationary energy supply mix by mid century. The other main blocks being renewable sources and nuclear. Furthermore, the role of low emission stationary energy, and therefore CCS, increases in importance as a mix of carbon constraints and oil depletion drives a shift towards electricity form transport.

Critically for CCS, and the future of the coal industry, the model showed that the role of CCS would be drastically curtailed if either the emissions constraints were delayed and then tightened very sharply, or if constraints increased strongly mid-century. Most models assume that the best capture technologies will address up to 85-90% of the CO₂. Ultimately, a rising carbon prices meant that even the remaining CO₂ not captured incurs a high cost. It remains unclear which of these scenarios is likely to play out and these models are not forecasts. However, they do enable us to explore the outcome of various policy mixes under different assumptions.

Our Focus of CCS Activity

In our view the challenge is actually to bring all of the elements of the CCS challenge together in the same place and at the same time. Projects that have failed or stalled have not done so due to the technical failure of the capture technology, although some have fallen over on storage. Secondly, in our view the key is to deliver an integrated CCS network, or at least design the physical, financial and regulatory framework for such a network. Whilst demonstrated technology is necessary, it is not sufficient nor the most important.

The most important drivers for delivering such projects are political will and corporate self interest, whether the latter is created by carrots or sticks doesn't really matter.

So, we have been working with governments to bring together the physical and financial elements of the chain, recognising that the regulatory and community outreach aspects will complete the necessary and sufficient set of conditions. Therefore, in addition to involving the emitters, transporters and storers, and bringing the technology providers and the EPC firms, we also involve, fully, the investment banks.

Current Status

As we look at the projects that we have been working on, other projects that we observe, or potential new projects that we can identify we see several key factors:

- Costs remain uncertain, but most estimates seem to have increased
- Storage issues have been vastly underestimated

- Community concern is a sleeping issue, although it has been awakened in a couple of cases
- Business models that will enable the funding and financing of CCS projects are extraordinarily underdeveloped. At the most recent meeting of the Foundation members of the GCCSI, there was a general consensus from industry members that funding and finance are at the centre of any practical deployment of CCS at commercial scale. Even when the capture costs are fully estimated, the storage identified and assured and the community concerns allayed, two major financial challenges remain:
 - The first is relatively easy, at least conceptually. The high initial costs of these first plants does lend itself to a degree of justified public funding and we see this being done through various capital grant schemes in Europe, the USA and Australia. The level of funding is very significant.
 - However, the more challenging issue arises from the fundamental driver of CCS itself. CCS, and indeed large scale solar, is more expensive than technologies that would be applied in the absence of a climate change issue. Whether the environmental cost of emissions is introduced via regulation, taxes or trading schemes, it only exists through the will of governments. Sometimes this issue is characterised as a desire or need for certainty. However, I do not think that is what is required, any more than industry has certainty in any other commodity. Of course, one relatively easy way to provide revenue certainty is via something like a feed-in tariff and these have been used in the renewable energy sector with mixed results. What is needed is predictability. How can industry have confidence in the future carbon market? Can industry and governments develop business models that address this issue and can models be created that develop innovative ways to think about and address the issues of risks that need to be managed. Do the roles for the private and public sectors need to further evolve as we create the essential new energy infrastructure of the 21st century?

- In our work, we are bringing in major investment banks and partnering with providers of both equity and debt to develop these business models. Some examples that are relevant to this issue are:
 - What sort of ownership structures apply to the elements of the CCS chain?
 - Is there a role for infrastructure asset structures i the transport side, and does this also apply to storage?
 - Is here a role for capital grants?
 - Is there a role for government to underpin the credibility of the emissions constraint, and if so, how might this role evolve over time as the market matures?
- I think that there are some clear principles that will be relevant to all CCS opportunities; and there will be other design parameters that will be country or system specific.

Key challenges

So, as I look at the key challenges and how they are being addressed, it seems to me that, whilst there is little disagreement in any listing I have seen, the approaches and priorities are precisely the wrong way around.

The focus on capture technology and demonstration projects is actually of lesser importance. The actual technologies are actually proven and in most cases performance guarantees can be secured. I do not underestimate the scale challenges nor ignore the issues of new capture technologies. However, I suspect that if the other elements were in place then these would follow much more rapidly.

Storage is a big deal. We seemed to have been acting on the assumption that the storage is simply there and will be available when needed. Partly this has been driven by the characterisation of storage as a relatively small proportion of the total cost. However, two points are worth making:

- Firstly, if there is no storage, then there is no CCS.
- Secondly, the analogy with the oil and gas E&P sector has been taken too far. In that case, the very high costs of exploration, in particular the

upside reward that provides the incentive for the high risks of finding oil and gas does both exist in the gas of CO₂ storage, and the upfront risks and costs of characterising and proving storage are rarely built into the quoted costs of CCS.

- The final point I would make on storage is to note the lead times involved, they considerably exceed the lead times for Greenfield capture plants, even new build and therefore.

The challenge on which I believe the greatest emphasis needs to be placed is that of designing the business models that will enable CCS infrastructure to be funded and financed. For example, most financial assessment of CCS projects tends to be based on traditional project financing models with a pretty bland approach to project cost of capital. However, we would argue that this does not represent anywhere near an optimal financial structure. I would caution that we are not suggesting that the lessons of the global financial crisis be ignored. However, even a superficial assessment will conclude that by appropriately unbundling and aligning risk and reward to lower both the return requirements of equity and debt and getting the leverage right, the overall project economics can be significantly improved. Furthermore, governments may find that there is a role for public sector funding in such structures that generates much greater impact for the same economic costs as the more common approaches such as capital grants. And finally, this is also an area where the international development banks can play a key role.

If the lights are going to stay on and the challenge of climate change is going to be met, then something will have to give. All of our thinking to date has to be challenged. It makes sense to us that we should be as aggressive in our search for better financial solutions as we are in the search for better technical solutions.