

2014 CSLF Technology Workshop

Summary and Key Messages from Session 2: Examining Technology Pathways and Business Models for Scaling up CCS

The session was chaired by Chang-Keun Yi (South Korea) and Richard Aldous (Australia).

Panelists were:

1. Michael Monea, Saskatchewan Power Corporation, Canada
2. Xiaochun Li, Academy of Sciences, China
3. Annika Seiler, Energy Division, Asian Development Bank

The three speakers covered many of the key issues around the technology pathways for scaling up CCS, from a national perspective (involving government strategy), from the perspective of an organisation constructing and operating a first of a kind technology and also from that of a financial institution looking at the financing risks associated with CCS on large scale operations.

It was clear from the discussion that private entities will not move to develop and scale up CCS technologies without either technology push, by way of grants and funding from governments, or technology pull created by the policy settings and constraints that society though governments imposes¹.

Overall there is a need for shared vision on the action that needs to be taken on climate change and the time frames that any action will play out in. Neither of these dimensions is clear at the moment but many private and public entities are inching forward in the direction of action on climate change, with many seeing CCS as a likely contributor that can ultimately do the heavy lifting on fossil fuel emissions. The development and scale up of CCS technology is occurring against this background. The emerging apparent roles of government, industry technology developers and financial institutions are clear, but the extent to which they are moving is variable and of course they are all inextricably linked.

Issues for Governments

A key back drop issue for governments is taking stock of potential sinks and matching to sources of CO₂. Many industrial and developing countries have now done this. The Chinese presentation set out the work being done in China on sources and sinks. Here over 200 gigatonnes (Gt) of practical capacity has been identified. CCS demonstration projects include: Shenhua (coal to liquids) trucking and storing 200 kilotonnes (kt) to date but potentially moving to 1 million tonnes per year (mtpa); the Jilu Oil field 0.8 mtpa starting in

¹ It was noted that society gives companies the mandate to operate and make profits, provided that they operate within the rules set by society, which often include impact on the environment, paying taxes etc. Their mission is to make money for shareholders in this context. Unless society changes the rules they will not be incentivised to develop technologies and deploy them for CCS.

2015 and Shengli EOR project (200kt has been injected and they will move to 1mtpa EOR in the next phase).

China like other countries is also mapping the maturity of the technology and the potential development pathways and looking to how this can be applied particularly in CCUS situations. The Chinese presentation set out storage capacity potential in China against different CCUS applications:

EOR	2- 19.2 Gt
ECBM	9.9 Gt
Enhanced Shale Gas	2 Gt
Enhanced Geothermal	7862 Gt
Uranium recovery from sediment hosted ore	1-40 mt
Enhanced Water Recover ²	66 Gt

Other issues include, considerations of efficient business models for CCS deployment in the short term and the longer term, the need for long distance pipelines due to the dislocation of sources and sinks and China's comparatively small and heterogeneous geological basins.

In summary, governments are involved in assessment of the situation in their countries, stimulation of technology development and skills development as well as demonstration. Ultimately the policy settings that may drive the commercial deployment of CCS and the regulations under which such activities must operate are the domain of sovereign governments.

Issues for Industry and operators

The workshop concluded that industry must work in partnership with technology vendors and governments in the early days. These links, including policy settings and grants are vital to develop test and deploy the technology and to assist in driving down costs through "learning by doing".

SaskPower worked with their existing infrastructure and resource base in conjunction with government grants and their local potential EOR operators to develop their business concept. Technology choice and associated risk management was important; the need for a test facility was emphasised - to test the prospective capture technologies with their flue gas.

The technologies need to be developed at scale; the OEMs need to be able demonstrate that they can scale up their technology. This was a definitive issue for SaskPower, their technology choice was strongly coloured by the fact that Cansolv had demonstrated that they could scale up scrubbing technologies.

² Saline water recovery was indicated for a scety desparately short of wter involving CCS and desalination of the water for human use and agriculture.

An important learning is that the next plant is likely to have 30% lower capital costs.

The workshop discussion also covered the need for 2nd and third generation technologies to ensure that they are also being moved to pilot scale and ultimately moved to large scale. The drivers from policy settings, industry entrepreneurship and step by step scale up were discussed in this context. All of these need to come together for success.

Issues concerning finance

With finance costs adding between 40 and 50% to the cost of power, the interface between technology and finance risk is an important dimension of the CCS technology development pathway. Ms Seiler's presentation stimulated this dimension of the workshop discussion, emphasising that the least cost technology was clearly important but overall integration risk and new technology risk mitigation were also vital. Lower risk means lower financing cost and lower risk to equity holders and hence expected returns on equity. The ADB is keen to remove barriers to CCS technology demonstration and scale up and sees that providing low cost capital and grants to demonstration projects is an important dimension in getting the technology established.

Some of the barriers include the public and political profile of CCS resulting in:

- Unfair cost comparisons being touted on CCS
- The low prioritisation of CCS technology development by governments, compared to other lower emission technologies
- CCS not being supported by low carbon policies

ADB emphasised the importance of technology road maps. The workshop also noted that these have been developed in many countries as a guide to where to focus development funds and industry and researcher attention.

The banking sector also sees the importance of VAT exemption, concessional financing, offtake agreements and capital grants as part of the array of mechanisms vital to the technology development and scale up.

In conclusion the chairs summed up the workshop discussion, noting the importance of vision by governments industry, financial institutions and technology developers. Continued sharing of the insights and knowledge between these players and collaboration between countries will be essential if the technology is to be developed and deployed in a meaningful timeframe. This needs to be linked to technology road maps, progressive policy settings and a clear understanding of the barriers and hence incentives required to drive the large scale demonstration and deployment of CCS.