

The Carbon Capture & Storage (CCS) Market 2013-2023

7.3 CCS TLM Limited and Charles Russell LLP

Headquartered in London, CCS TLM provides integrated, expert consultancy, Engineering and advisory services to the growing carbon, capture and storage (CCS) market. CCS TLM employs professionals with first-hand experience of developing commercial scale CCS. Meanwhile, Charles Russell, through its Cleantech Group, is one of the very few law firms to have undertaken substantive work in relation to the CCS industry, including in relation to intellectual properties and licensing, but also in connection with the establishment and development of CCS TLM. Visiongain interviewed Dewi ab Lorwerth from CCS TLM and David Berry from Charles Russell LLP and would like to thank them for their comments.

7.3.1 Involvement of CCS TLM in the Carbon Capture & Storage Market

Visiongain: What type of unique technologies, product, services or solutions does CCS TLM provide in/for the carbon capture and storage industry?

Dewi ab Lorwerth: CCS TLM's sole focus is to support the development of CCS projects through the provision of real experience and capability. The management team of CCS TLM are amongst the most experienced and successful developers of CCS projects anywhere, having previously been responsible for a number of landmark projects globally.

The founders of CCS TLM have a rich history of project development of de-carbonised fuel for power generation and industry with carbon capture and storage (CCS). Since 2005, they were members of BP's Hydrogen Power business committed to developing projects in all the key geographies of the world where fossil-fuelled power generation is a necessity and cleaner, more sustainable energy forms are an increasing requirement, e.g. Peterhead (Scotland), California in the US, Kwinana in Australia and Abu Dhabi in UAE, for BP and then Hydrogen Energy International Limited.

CCS TLM offers advisory services based on real project experiences and, we believe, is the only consultancy that can credibly do this. Advisory services include; technical & engineering, commercial structuring & finance, value chain analysis & integration, storage site selection, site development and EOR. Currently CCS TLM is collaborating with the Australian Coal Association, the Government of Trinidad & Tobago and the ROAD project in Rotterdam among others.

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7.3.2 Development of “Clean Power” Technologies

Visiongain: What are the most significant drivers or motives for carbon capture and storage? How much are climate change and other factors like energy recovery providing a motive?

David Berry: Governments from many countries are accelerating their drive to combat climate change with a sharp focus on the power sector – the source of 40% of man-made CO₂ emissions. Installed generating capacity today is approximately 4000GW with nearly 20,000TWh annual output, worth trillions of dollars of revenue globally. This installed capacity is projected to almost double by 2030 and taking replacement plants into account this means that two thirds of the plants required by then are still to be built. Assuming a nominal plant size of 500MW this equates to more than 10,000 new build plants by 2030. As far out as 2050, fossil fuels are expected to provide up to 50% of the world’s power sector demand, making a means to decarbonise the fuel to those plants, and reduce the power sector’s emissions of CO₂, a compelling opportunity for all stakeholders.

Reductions in global emissions of CO₂ must be achieved in the context of rising demand for energy. Although a number of “clean power” technologies are being deployed and further developed (e.g. nuclear, wind, solar), the rising demand for energy is expected (under business as usual scenarios) to result in increased use of fossil fuels, the main current source of man-made CO₂ emissions. Carbon-based fuels for power generation (coal, oil, and natural gas) currently supply over 85% of the world’s commercial energy, with consumption expected to continue to grow. These fuels will remain the primary feedstock to the power sector for many decades and thus the necessity for addressing CO₂ will be ever-present.

In order for CCS technology to realise its full potential to reduce carbon emissions growth, it would have to be applied on a much larger scale than is currently being done for enhanced oil recovery (EOR). Meaningful industrial CO₂ capture is urgently needed particularly in the electricity generation sector. Despite numerous CCS projects being announced around the world not all of them have progressed - this is a testament to the difficulty in developing these complex projects.

7.3.3 Restrictions & Challenges Facing the Carbon Capture & Storage Market

Visiongain: What are the restraints/challenges/difficulties/threats facing the carbon capture and storage systems market?

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Dewi ab Lorwerth: Whilst every project is different and has unique attributes, there are underlying common factors that make for a successful CCS project, or challenges to be overcome:

Political & fiscal support is vital to ensure successful project completion through the alignment of commercial and political aspirations;

- A market price signal for CO₂ that provides project developers (& financiers) with long term basis upon which to base their investments
- Robust and global solutions to knowledge sharing is key to ensuring the successful development of CCS as an emerging technology/industry; and
- A robust sink (CO₂ store) is also key to ensure that the long-term storage of CO₂ can be confidently assured to support the development of the CCS industry

7.3.4 Future Developments of Enhanced Oil Recovery (EOR) with Carbon Capture & Storage

Visiongain: Which technological advances are or will help overcome challenges facing carbon capture market and how?

Dewi ab Lorwerth: CO₂ capture, transportation, and injection underground into deep geological formations is in practice today, but on a relatively small scale. Component technologies of CCS have been applied in various sectors, but combining them in a full-scale operating power plant has not yet been done. For 40 years, the oil industry has been using CO₂ as an injection gas for EOR at a variety of sites around the world. The results of EOR have added to government interest in providing financial incentives to develop demonstration projects.

7.3.5 Barriers to Entry into Carbon Capture & Storage Market

Visiongain: How can political/economic /institutional or regulatory /social barriers to the CCS market be overcome?

David Berry: Commonly recognised “barriers to entry” for potential CCS project developers, are: Lack of long-term pricing signal for CO₂ to support investments. Current EU Emission Trading System price in Europe at €7-8/Tonnes of CO₂ is not sufficiently rewarding to support the high capital cost of FOAK (first of a kind) projects. The scope of the EU ETS, i.e. only as far as 2020 is also not enough of a support mechanism for a new power plant with CCS (typically costing \$2-3bn each) with a lifetime of 25-30 years.

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Long-term liabilities for monitoring CO₂ behaviour post injection. Most (if not all) CCS projects will have a typical life expectancy of 25-30 years. Most national Governments who are developing CO₂ storage regulations are leaving an obligation on the project owner(s) to monitor the behaviour of the CO₂ in the sub-surface for 20-30 years beyond the date of final injection (reservoir closure) before the State then accepts full long term liability for the reservoir.

Not only is the duration of this obligation a barrier to entry, but so is the variability of such regulations across the globe. Regulators/Policy-makers should be consistent with their requirement and reduce the insistence on onerous obligations. In summary, political and fiscal support for CCS is critical. Innovative technology alone will not get these projects up and running. After some years of discussion the UK Government is implementing specific incentives and policies to support CCS. This contrasts with other jurisdictions, for example in Australia where it appears to be used as a political football.

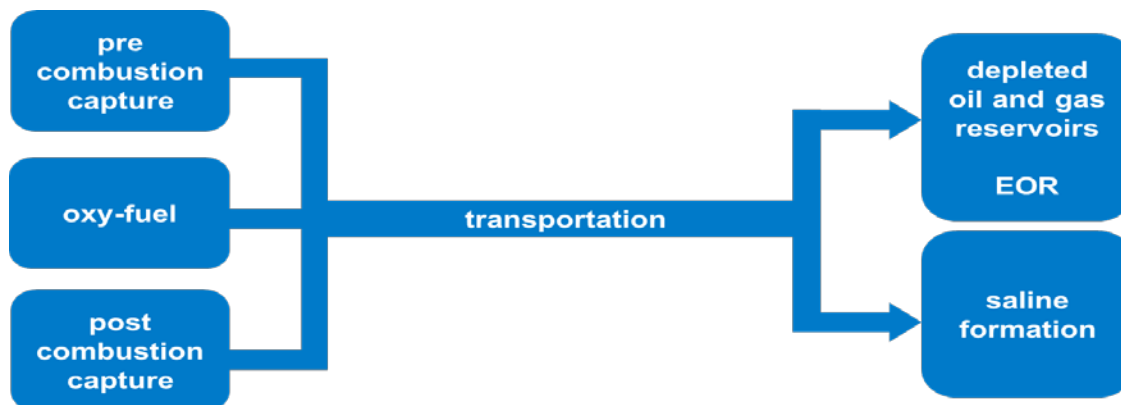
7.3.6 New Technologies in Carbon Capture & Storage

Visiongain: Are there any particular trends in the carbon capture and storage market with regard to technologies used?

Dewi ab Lorwerth: The emerging CCS industry is the single-most challenging and exciting aspect of today's global energy sector. As a fledgling industry, there are no "trends" developing of any significance yet. However, it is commonly understood and commercially prudent to apply pre-combustion capture of CO₂ solutions to new-build opportunities and where power generation may not be the only product being targeted (e.g. hydrogen for refineries & industry). Likewise for oxy-combustion solutions – these are mainly reserved for new-build projects rather than retrofit. Post-combustion capture solutions can be retrofitted to existing plant as well as being applied to new-build projects. In terms of storage, it appears that most (if not all) North American projects (both USA and Canada) are aiming for EOR solutions, whereas other jurisdictions (e.g. Europe) are focusing on depleted gas fields and/or saline formations for "pure" storage.

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Figure 7.1 Main Carbon Capture & Storage Industry Divisions



Source: *CCS TLM*

7.3.7 New Opportunities in the Carbon Capture & Storage Market

Visiongain: What are the opportunities in the carbon capture and storage market, from a business development point of view, in the years to come?

Dewi ab Lorwerth:

Hythane:

- clean hydrogen (manufactured from gasification of coal, or reformation of natural gas) being injected into the gas transmission/distribution systems (up to 5-7% by volume), thereby reducing the natural gas consumers' carbon intensity further (natural gas is already the "cleanest" of all fossil fuels).

Electrification of transport sector:

- Converting motor vehicles to operate on electricity is in itself a CO₂ abatement strategy (CO₂ emissions from power stations feeding the electrical grid is less than the aggregate of all motor vehicles' emissions).
- By combining electrification of vehicles with power generation with CCS yields further carbon emission reductions.

7.3.8 Fastest Growing Carbon Capture & Storage Regions

Visiongain: Which continents/countries, do you think, will see greater investment in carbon capture and storage technologies over the next ten years and why? Which continents/countries markets are least likely to invest in these technologies and why?

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David Berry: For 1st generation CCS projects, i.e. those being developed or constructed in next 10 years, the natural home for them are in the geographies of the world where there is currently greatest overlap of CO₂ (single point) sources such as power generation and large heavy industry and a fully characterised portfolio of hydrocarbon producing/depleting reservoirs.

This exercise quickly identifies the following geographies as “1st movers” for CCS:

- North America (USA & Canada);
- Europe (particularly the “North Sea Rim”);
- Australia;
- China, and
- Middle East

7.3.9 Future Spending in the Carbon Capture & Storage Market

Visiongain: How do you expect to see the global investment in carbon capture and storage market to develop over the next ten years?

David Berry: For an estimate of the CCS market size, the International Energy Association expectation is for 100 projects required globally by 2020 at \$2bn each, that's a global market of \$200bn (cumulative) in next 8 years. In UK, realistically no more than 4 projects, so \$8-\$10bn (cumulative) market size from now till 2020.