

Carbon Capture and Storage: Lifting the barriers

The development of Carbon Capture and Storage (CCS) requires not only consistently higher carbon prices than prevail today but also the settlement of key legal issues. Whilst much work is required on the part of legislators, a regulatory framework for CCS is slowly growing in various jurisdictions. The EU has recently taken a large step forward with release of a draft CCS Directive.



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In this article, **Simon Tysoe**, a senior associate in Herbert Smith's London office, considers the principal legal impediments to the development of CCS projects and the steps being taken to overcome them.

Clean coal

The term "clean coal" covers any initiative designed to enhance both the efficiency and the environmental acceptability of coal extraction, preparation or use. CCS however, is considered important in lowering the high-intensity carbon emissions from coal-fired power stations thus the term "clean coal" is commonly used interchangeably with CCS.

CCS is one of a number of approaches to mitigating climate change by reducing emission of greenhouse gases into the atmosphere. It involves capturing CO₂ emissions from large point sources such as power plants prior to compressing, transporting and storing it securely in geological formations. The CO₂ emitted is thus prevented from entering the atmosphere. CCS is believed by many to have massive potential to significantly reduce CO₂ emissions.

The processes

The CCS process falls into three key stages:

- CO₂ separation and capture;
- CO₂ compression and transportation; and
- CO₂ injection and storage.

Capture of the CO₂ may occur in three principal ways: through post-combustion flue gas separation, through oxygen fuelled combustion or through pre-combustion capture.

The capture stage is followed by compression of the CO₂ into a liquid or supercritical form and then transportation to a storage site.

The final stage is storing the gas, which usually involves injection into underground geological formations such as hydrocarbon reservoirs or aquifers, both onshore and offshore. Other storage mechanisms such as storage

by direct injection into deep water have also been investigated.

Legal issues surrounding CCS

Regardless of the regulatory system considered, the legal impediments to the implementation of CCS projects tend to increase as the CO₂ gets further down the CCS chain.

The processes of capturing the CO₂ raise relatively few legal issues. In essence these are industrial chemical processes and so the development of plant to carry this out would likely be done within the existing framework of planning, health and safety and environmental regulations in the relevant jurisdiction.

The legal issues associated with CCS begin to appear once the CO₂ has been captured and stem from the classification of CO₂ as "waste" and the existing restrictions on the handling and disposal of waste under local and international law.

The storage of CO₂ raises further issues, principally of land ownership and of short, medium and long term liability for stored CO₂.

The final barrier which CCS faces is one which pervades all of its elements: that there is little in the way of stable financial incentive for the construction of what is inevitably a costly engineering project.

In the EU, many of these impediments stem from existing EU legislation. Measures put forward in the European Commission's proposal for a Directive on the geological storage of carbon dioxide (the draft CCS Directive), published on 23 January 2008, would, if adopted, make major inroads in relation to a number of these issues.

While some Member States are pushing ahead with the development of their own regimes – notably the offshore CO₂ storage proposal by the UK in its recent Energy Bill, the time lag for the introduction of harmonised EU wide measures will mean that there will be substantial “legacy” issues for some years. In this article, we will concentrate on the legal issues surrounding the development of CCS projects and how these are likely to be overcome by the draft CCS Directive.

CO₂ as waste – the current issue

Legal issues arise in relation to CO₂ once it is captured because, as a by-product of an industrial activity, CO₂ is apt to be classified as “waste” in many jurisdictions. Under EU law, the issue of whether CO₂ is a waste product turns on whether the holder of the CO₂ discards or intends to discard the CO₂. This has wider application since an almost identical definition to that used in EU law has been adopted by the Organisation for Economic Cooperation and Development (the OECD) which means the same issue will arise in countries such as Australia, Japan and the United States. On its face, transporting captured CO₂ for indefinite storage without any intention to recover it appears to demonstrate an intention to discard.

Accordingly, CO₂ is likely to be considered waste under existing EU legislation, and therefore make the activity of CCS in the EU subject to waste treatment regulation, in particular the EU Waste Directive, the EU Waste Shipment Regulation and the EU Landfill Directive, under which the injection of liquid waste into landfill sites is prohibited. The one exception is where the CO₂ has an immediate and certain further use in an ongoing process of production such as in enhanced oil or gas recovery¹.

Implications for transportation

As regards transportation, the principal issues relate to the transportation of CO₂ across national boundaries. Transboundary shipment within and (potentially) out of the EU will be an issue which affects European CCS players in particular. The Waste Shipment Regulation prohibits the export of waste for disposal outside the EU. Where shipment is not prohibited (ie, within the EU), the trans-frontier shipment control system is based on “prior informed consent”. It requires notification, where appropriate, to the competent authorities of dispatch, destination and transit, using a consignment note containing prescribed information. The regulation also requires shipments of hazardous waste to be covered by a financial guarantee. These obligations are likely to be incompatible with the sort of arrangements likely to be favoured for CO₂ storage.

Implications for onshore storage

The onshore storage of waste is apt to fall under EU landfill legislation. The injection of liquid waste into onshore petroleum reservoirs has been considered by the English courts in this context and the relevant site at

which this was happening was held to be a landfill site², giving rise to provisions relating to site selection, site design, waste acceptance criteria, provision of financial security and closure procedures.

In addition, storage in onshore aquifers is prohibited by the Framework Water Directive. The draft CCS Directive would radically change the regulatory landscape by removing CO₂ storage from all of these restrictions and this permitting transportation and onshore storage. However, even if adopted, it is likely to take some years for the amendments to be enacted.

Implications for offshore storage

Given the potential issues with onshore storage and the time taken for them to be overcome, it is likely that CCS projects will look to offshore storage in the near term. Storage of CO₂ in the seabed requires consideration of the principal conventions governing the international marine environment.

With 80 contracting parties, the London Convention is by far the most geographically significant convention in this regard. The London Protocol to the Convention was amended in October 2006 to allow injection of CO₂ if:

- (i) the disposal is into a sub-seabed geologic formation;
- (ii) the CO₂ stream consists overwhelmingly of CO₂; and
- (iii) no other waste is added for the purposes of disposal.

The parties to the London Convention have subsequently engaged in the development of a set of guidelines on CCS risk assessment and management which were adopted by the contracting parties in November 2007.

For projects located in the seas off northern and western European states, including the UK, Scandinavia, Germany, the Netherlands and France, the OSPAR Convention contains a prohibition on the dumping of waste similar to that in the London Protocol. In June 2007, the contracting parties amended the OSPAR Convention to allow the storage of CO₂ in geological formations under the seabed. However, this still requires ratification by at least seven contracting parties and may not, therefore, come into force for a number of years.

Property rights

It is crucial for a CCS investor to have certainty as to its property rights over storage sites. In jurisdictions such as the UK, which do not vest ownership of the sub-surface in the state, the acquisition of sub-surface rights could be problematic since the geological formations used for storage may well straddle a number of different landholders' properties. In order to facilitate development in these jurisdictions, a regime for the compulsory acquisition of rights of access to the sub-surface land would be useful. Such powers are commonly granted to



developers in analogous industries such as gas storage in the UK, though many such projects in the UK have sought to resolve these issues by private treaty with landholders rather than rely on such powers. This is largely because of experience of delays in exercising such compulsory powers and also because in today's environment, few developers would wish to push a project through against local opposition in reliance on these powers. However, the mere fact that the powers exist can of itself assist any would-be developer in seeking to negotiate access rights.

The allied issue of planning consent also needs to be addressed to ensure that an efficient planning regime is in place that can balance international and national needs against local concerns. In the UK, the Government White Paper "Planning for a Sustainable Future" cites CCS projects as the sort of project which should be dealt with at a national level.

The landholder issues are less complex offshore. In the UK offshore environment, once the UK's rights under UNCLOS are asserted, the necessary land rights can be granted by the Crown. Perhaps for this reason, the UK has concentrated on offshore storage in its regulatory regime, with the power to create gas importation and

storage zones contained in the Energy Bill. However, offshore projects may face transboundary issues thrown up by differing legal regimes regarding title, access, liability and other critical issues. Contractual solutions such as unitisation agreements may be used but ultimately the effective resolution of transboundary issues will depend on the co-operation of national regulators in much the same way as it does today for the hydrocarbon industry.

The draft EU CCS Directive does not seek to address these issues and it will be for the individual Member States to address them as appropriate. However, it does recognise that there is a need for effective regulation by means of the licensing and provides for each Member State to appoint a regulator and sets out the framework for storage licences and indeed, licences to explore for storage sites. It also proposes that the EU Commission acts as a co-ordinating body, ensuring consistency of approach and also regulating transboundary issues. The successful implementation of this part of the draft legislation will be crucial.

Liability issues

The issue of the assumption of liability is often cited as one of the main barriers to investment in CCS. At first

sight this focus on liabilities seems curious. CO₂ is not a particularly hazardous substance, particularly when compared with natural gas, and the risks of operating facilities which have the much greater potential to cause catastrophic damage are accepted by facility operators and insurers in the power and hydrocarbon industries.

The issue is so acute in CCS because the liabilities for leakage could arise centuries after the cessation of storage when the operator has ceased to exist and the storage sites have been sealed and the infrastructure decommissioned. Any financial gain enjoyed by the operator might well have been dissipated some considerable time before the leakage occurs and it may be impossible to subsequently seek compensation from the person who benefited from the storage of the CO₂. In the absence of any other provision, the liability will be likely to default to the tax-payer.

The conventional solution to the issue of operator credit risk would be for operators to lodge security. This approach is simple and in accordance with existing practice in the oil and gas industry. However, unlike the costs of decommissioning existing facilities, the costs of tackling leaks of CO₂ from storage sites and remedying the damage caused by them is hard to ascertain. Any attempt to quantify these costs will rely on estimates of abatement costs and leakage probability which, at this early stage of the development of CCS projects, would be little more than well educated guesses. The lodging of security may only address short to medium term liability in this context, as the longer term existence of any private sector insurance company or bank that provides the relevant security cannot in itself be relied upon.

Given these difficulties, it has been widely proposed that liability for leakage be transferred to the relevant government at the time storage facilities are sealed and decommissioned. This approach seems to offer the greatest hope that any leakage costs will be covered and that storage sites will be maintained and monitored correctly. Transferring liability to the government immediately rather than waiting for the government to act as a “remediator of last resort” also seems a pragmatic approach.

Whilst there are clear reasons why governments should ultimately take responsibility for liability, it is likely that where they do so they will seek to put in place legislation to pass some of this liability back to participants in the industry or create funds from the industry players to offset such future liability. The draft CCS Directive adopts this approach by stating that the Member State in which a storage site is located will take over responsibility for the storage site (and associated liabilities) at a pre-defined handover point or by default if the operator ceases to be able to perform its obligations.

However, it also allows the relevant Member State to seek security from the operator to cover its prospective liabilities and the precise scope of this is currently uncertain.

Financial incentives for CCS

Clear financial incentives coupled with appropriate legal or regulatory requirements will be central to the deployment of this technology. CCS, particularly in developing countries, could be incentivised by crediting CCS activities through clean development mechanism (CDM) projects. The CDM is one of the three mechanisms developed by the Kyoto Protocol, and sits alongside the EU Emissions Trading Scheme (EU ETS) and Joint Implementation (JI) programme. Projects accredited through the CDM are allowed to earn and trade emissions credits. This mechanism helps identify lowest-cost opportunities for reducing emissions and attract private sector participation in emission reduction efforts. Developing nations benefit in terms of technology transfer and investment brought about through collaboration with industrialised nations.

Whilst methodologies for rewarding the reduction of CO₂ emissions from coal plants were adopted by the IPPC in 2007, CCS is not specifically included in the CDM of the Kyoto Protocol. There has been speculation for several years that CCS projects may soon qualify as CDM projects but progress has been slow. Whilst the Conference of the Parties in Bali in December 2007 did not result in concrete guidance being given to the Panel, there was commitment that the matter should be worked on over the coming year and revisited in December 2008.

Currently, CCS is not specifically recognised as an emissions reduction measure in the EU ETS. The EU ETS does not distinguish between power stations with CCS technology and power stations without and so an allowance is required for each tonne of CO₂ produced from a power station whether or not it is stored. Despite this, the UK Government has indicated in its National Allocation Plan for the 2008–2012 Kyoto Commitment Period that it intends to recognise CCS projects during this period, most likely to be achieved by the “opt-in” process under the EU ETS.

The draft CCS Directive contains proposals to address this. Under the proposals, stored CO₂ will not be counted as being emitted for the purposes of the EU ETS and allowances will therefore not need to be surrendered for the stored CO₂. A CCS equipped generator will be free to sell its spare credits and generate income to offset the cost of its investment in CCS.

However, even if the EU ETS is amended to include CCS, it is doubtful that this will be sufficient to enable

the development of commercial scale CCS projects in the EU until such time as the price of carbon consistently reaches a sufficient level and the cost of CCS is reduced.

Alternatively, or in parallel to offering financial incentives, governments might enact legislation requiring new power plants to be built with CCS technology, or possibly even require existing power plants to retrofit the necessary technology. The draft CCS Directive includes an obligation on all new-build combustion plants with capacity over 300MW to have, as a condition of their permit, a suitable space on the site for CCS equipment to be retro-fitted, but stops short of mandating CCS.

At present, UK planning consents under section 36 of the Electricity Act 1989 provide that the layout of any proposed generating station shall be sufficient in size to accommodate any carbon capture plant which may be required in the future. The EU envisages that by 2020, all new power plants within the EU will be built with mandatory carbon storage technology.

In November 2007, Washington state officials from the Energy Facility Site Evaluation Council unanimously suspended a proposal to build a coal gasification power plant until the consortium addressed how it will sequester carbon emissions. Developers were only prepared to submit a specific plan once geological sequestration became a 'proven technology' however this was considered unacceptable as some speculated this proposal may have been submitted as late as 2020. In contrast, ballooning construction costs of the flagship Future Gen CCS equipped power plant in Illinois caused the US Energy Department, in late January 2008 to pull out of the project and instead offer to fund "multiple" (smaller) projects with the aim of equipping commercial scale integrated gasification combined cycles coal plants with CCS by 2015. This potential setback arguably pushes Europe to the forefront of CCS development.

Whilst mandating CCS would perhaps bring in CCS earlier than simply relying on investment signals from the market, they would do so at a high cost. Without some "carrot" to accompany the "stick", the mandatory imposition of CCS might lead to unintended

consequences, such as the "offshoring" of generation to less restrictive jurisdictions (where possible) or, in deregulated markets, the stagnation of plant building and consequential economic harm.

Conclusion

All technologies aimed at the reduction of greenhouse gases, including renewables, are to a large extent dependent on regulatory policy to give them the necessary "push-start" to enable them to compete. Specifically, they require support schemes that compensate projects for their positive environmental impacts and their contribution to security of supply. Since CCS is more innovative, complex and capital intensive than most technologies, it is necessarily more sensitive to its regulatory environment. The draft CCS Directive offers welcome guidance on many of the key issues and sets out a framework for the development of CCS in the EU. It is expected that the consultation process will provide further details of the future regime.

UK Energy Bill

In the Energy Bill, the UK Government has proposed putting in place a licensing and enforcement framework (including any financial security required) for companies carrying out carbon storage (including prospecting for and developing storage sites). Licences would be granted by the Secretary of State or a delegated authority. The proposed framework is currently limited to the offshore storage of CO₂, as regulating the onshore storage of CO₂ would require amending existing EU Directives.

Further information on low-carbon technologies

Herbert Smith has recently contributed a legal analysis of the major issues involved in investing in key low-carbon technologies in the London Accord, a research initiative to put London at the leading edge of investment research into technologies needed to tackle climate change. The initiative has been established by the City of London and BP, supported by leading investment banks and research houses, major institutional investors, key NGOs and academics. You can read the report of the London Accord at <http://www.london-accord.co.uk>.

footnotes

1. "Enhanced Oil Recovery: Enhancing energy security and emissions reductions" *Energy Exchange* issue 26. Under the draft CCS Directive, CO₂ captured and transported would be excluded from the definition of "waste", thereby allowing Member States to amend their legislation to remove some of those hurdles.
2. *Blackland Park Exploration Limited v Environment Agency* [2003] EWCA Civ 1795.