Carbon Capture and Storage – A Legal Perspective

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1. Introduction

International policymakers are increasingly seeing carbon capture and storage (CCS) as an appealing climate change mitigation option. Not only does it have environmental benefits, allowing for the reduction of levels of carbon dioxide (CO_2) into the atmosphere, and significantly without having to give up using fossils fuels; it has market value too, being attractive to industry who envisage that it could potentially encourage financial markets to flourish through major projects (some of which will be state financed) and trading.

While CCS has been gaining policy support as a potentially significant solution to tackling climate change, there has been growing discussion as to the circumstances in which the storage of CO_2 will be both relevant to and consistent with international and regional laws. Doubts over compatibility with policy plans and the existing legislation in place have sometimes surfaced because the current legal frameworks are often ambiguous, primarily because laws were not originally drafted with this mitigation option in mind. There are numerous overlapping legal regimes which will impact on both offshore and onshore CCS storage, and recent studies on the legality of CO_2 storage under these have concluded that changes to legislation and rules could be required in some instances if this mitigation option is to be seriously pursued.

Policy backing for CCS has been particularly supported by the engagement of the European Union (EU) and its Member States in seeking changes to international legislation that could prevent or restrict CCS projects taking place, as well as pursuing an enabling CCS legislative framework within the EU itself. Driven largely in part by European support, there have been significant legal and policy developments at international and EU law in a very short space of time. This paper provides an up-to-date examination of a number of key existing CCS legal mechanisms and regulatory options at EU and international level and proposals for their change, which it is hoped, could eventually resolve some issues of legal ambiguity. We will analyse three key areas of legal interest in Europe with regard to carbon capture and storage (CCS) technologies.

Offshore storage in sub-seabed geological formations will be the main CCS target sites in the EU, so we consider first the most relevant regulatory systems with regard to the disposal of waste in the marine environment. The United Nations Convention on the Law of the Sea 1982, the London Convention 1972, its later 1996 Protocol, and the regional 1992 OSPAR Convention, have all come under close scrutiny in recent

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years from bodies such as the International Energy Agency[2] and Intergovernmental Panel on Climate Change[3], and initially proved to pose considerable obstacles to certain CCS projects being undertaken. CCS is now arguably at the forefront of current climate policy and this is reflected in the unusual pace of legal developments within marine legislation; we shall discuss contemporary policy development and amendments to these conventions to allow for CCS under certain circumstances.

The second issue to be examined will be the possibilities for CCS in the portfolio of climate change mitigation mechanisms. Current international and regional climate agreements contain no explicit reference to the use of CCS, so we will discuss policy developments in relation to the United Nations Framework Convention on Climate Change, Kyoto Protocol and the European Union's Emission Trading Scheme (EU ETS). A particular focus will be on the possible impacts of proposed new accounting and inventory methodologies, the proposal to include CCS in the flexible mechanisms created by Kyoto, and the interaction between the Protocol's flexible mechanisms and the EU ETS. We will consider gaps in the current legal regime and how they may be adapted to incorporate CCS projects.

Our final area of analysis will be on developments in relation to proposals to implement a regulatory framework for CCS in the EU. There currently exists no national or EU regulatory framework regulating CCS projects, although there are laws of relevance. We shall analyse the European Commission's proposals for the development of an enabling legal framework for CCS in the EU. These proposals are still at a developmental stage but are significant; not only because they are examining introducing a legislative framework for all members of the EU, but this may also prove to be an international blueprint for developing CCS legislation at regional and international level.

2. Marine Legislation

Three main international marine agreements have been identified as containing potential obstacles to the deployment of CCS. The United Nations Convention on the Law of the Sea (UNCLOS) 1982 is a framework agreement, which provides protection to all marine areas; the London Convention of 1975 and its superseding London Protocol of 1996, were created to protect the marine environment and prevent pollution caused by the dumping of waste. The international marine regulatory system cannot be considered in isolation in this instance; contracting parties to the conventions and protocols discussed above are also often parties to regional agreements. In the EU the most relevant regional legislation concerning CCS is the OSPAR Convention, which governs the protection of the marine environment in the North-East Atlantic and North Sea.

[2] IEA (2005), Legal Aspects of Storing C02
[3] IPCC (2005), Carbon Dioxide Capture and Storage

(i) UNCLOS

UNCLOS does not mention CCS anywhere in its text, so it could not be said to expressly prohibit CCS activities, although it does contain explicit provisions for the protection of the marine environment in its text which may well have an impact if certain CCS activities are deemed to constitute pollution. It seems that there is no conclusive opinion as to whether CCS would constitute pollution under current definitions, and it seems somewhat unlikely that this will be formally clarified through legislative amendment to UNCLOS to expressly allow for CCS. This is because UNCLOS is a framework law, which leaves the elaboration of precise rules to be made in other more specific laws such as the London Convention and its 1996 Protocol.

(ii) The London Convention and its 1996 Protocol

The London Convention and its 1996 Protocol are the most relevant international laws with regard to offshore CO_2 storage. The London Convention was the first international agreement to provide protection to the marine environment from the deliberate disposal at sea of wastes, but it was decided in the 1990s that it required modernisation in the form of the 1996 Protocol. This Protocol has now entered into force, and it supersedes the London Convention, for those parties to the Convention which have subsequently become parties to the Protocol. The Convention currently has 82 parties and the Protocol has 31 parties[4], so in effect, the two instruments continue to apply in parallel, until such time as more parties ratify the Protocol. This is significant because they deal with the issue of CCS in different ways and will require individual analysis.

The London Convention prohibits the disposal of all wastes specified in Annex I, and regulates wastes listed in Annex II. CO_2 is not referred to in either of these Annexes as a substance that cannot be dumped, or that requires a special permit to be dumped. Whilst it is not specifically referred to in any of the lists prohibited for disposal in Annex I of the Convention, it will probably fall under the 'industrial waste' category in the Annex if it can be shown that it derived from a manufacturing or processing operation. The Convention's own Scientific Group, which has an advisory role, decided that CO_2 derived from fossil fuels was to be considered an 'industrial waste'[5], although no consensus has been reached on this issue amongst the various international signatories to the Convention.

As it stands it is arguable whether the London Convention would allow for offshore CO_2 storage to take place, although there seem to be a number of potential exemptions in the Convention as it stands which could allow for this under certain circumstances[6]. Most importantly, the Convention seeks only to control dumping at 'sea' and this could arguably not cover CO_2 storage which takes place in geological formations below the sea column. The second possible exemption is that the Convention only applies to activities using ships or platforms to

[4] International Maritime Organization (IMO) website. Last visited 20 August 2007.
[5] IMO (1999) Report of the Twenty-Second Meeting of the Scientific Group to the London Convention
[6] See further: Purdy, R., '*Geological Carbon Dioxide Storage and the Law*', Chapter 4, in Gough, C. & Shackley, S. (eds.) in Capturing Carbon: The Prospects for Carbon Dioxide Capture and Storage in the UK, 2006, pp87-139, Ashgate.

dispose of CO_2 into the marine environment and there are no controls governing pipeline discharges from land-based sources. If it is technically possible to transport CO_2 by pipeline from land-based sources directly to sub-sea bed repositories then this will not fall foul of this Convention. The final potential exemption is that activities in which CO_2 is re-injected into the seabed following the normal operation of an installation, for the purpose of enhanced oil recovery (EOR) or for separation, would also be permissible under the Convention.

In March 2006 the 1996 Protocol to the London Convention entered into force. It contains more restrictive measures regarding the dumping of waste and all contracting States are required to prohibit the dumping of wastes listed in Annex 1 to the Protocol'[7]. None of the categories originally listed in Annex 1 allowed for CO_2 storage. Following the Protocol's entry into force and various legal and technical reviews; Australia, co-sponsored by France, Norway and the United Kingdom, submitted a proposal to amend Annex I to allow the storage of CO_2 in sub-seabed geological formations[8]. At the first meeting of the Contracting Parties to the Protocol in November 2006, a resolution to amend the Protocol was adopted.

The amendment entered into force in February 2007 for all Contracting Parties to the Protocol; save for those who sent a declaration to the IMO with regard to their inability to accept the amendment within the time frame designated under Article 22. The new Protocol amendment inserted an eighth category into the Annex 1 category of wastes that may be considered for dumping. This category consists of '*Carbon dioxide streams from carbon dioxide capture processes for sequestration*'. Further clarification is provided by way of a new subsection 4, which details the circumstances when these CO_2 streams may be considered for dumping; '*1. Disposal is into sub-seabed geological formation; and 2. They consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and 3. No wastes or other matter are added for the purpose of disposing of those wastes or other matter.[9]'* The new provisions inserted into Annex 1, provide a basis for the regulation of CO_2 sequestration in sub-seabed geological formations under the Protocol's mechanisms.

CO_2 streams that are to be sequestered are subject to permitting in accordance with the terms of Article 4 of the Protocol, which requires that; '*Contracting Parties shall adopt administrative or legislative measures to ensure that the issuance of permits and permit conditions comply with the provisions of Annex 2. Particular attention shall be paid to opportunities to avoid dumping in favour of environmentally preferable alternatives'.* The effect of this licensing process shall mean that, for a permit to be granted by a Contracting Party's government, an applicant shall be required to demonstrate compliance with the provisions of Annex 2. This Annex requires that permits are only issued where all '*impact evaluations are completed and the monitoring requirements are determined*'; it follows therefore that the creation of an adequate monitoring mechanism for CCS is essential to ensure compliance with the terms of the Protocol. Permits issued for CCS, must contain data and information

[7] 1996 Protocol, Article 4
[8] IMO, C02 Sequestration in sub-seabed formations: Consideration of Proposals to Amend Annex I to the London Protocol, LP 1/6, April 28, 2006.
[9] 1996 Protocol, Annex 1, subsection 4

on: the type of material to be dumped; the location of any proposed dump site; the method to be employed for dumping and any proposed monitoring and reporting requirements[10]. Provision is also made for the review of permits at regular intervals; a process which it is envisaged will prove to be invaluable for determining the continuance, modification or revocation of permits.

At the first Meeting of the Parties to the London Protocol in November 2006, following the resolution to include CO_2 sequestration in Annex 1 of the Protocol; the Scientific Group which was established to advise the Parties, was formally charged with developing and preparing guidelines for assessing CO_2 streams that are to be disposed of in sub-seabed geological formations. A CO_2 Intersessional Technical Working Group and Correspondence Group established by the Scientific Group prepared draft guidelines with a view to their formal review at the 30th Meeting of the Scientific Group, which was held in Spain in June 2007. These draft specific guidelines, which use Annex 2 to the London Protocol as a basis, list all the steps that must receive consideration before a decision is made to issue a permit.

The next meeting of Contracting Parties to the London Protocol in November 2007 will address some of the key outstanding areas regarding CCS. The Scientific Groups report and draft guidelines will be discussed at this meeting, where they may be adopted. The list of items also agreed for inclusion in the agenda at the meeting also includes legal issues surrounding CO_2 sequestration and the creation of procedures concerning liability arising from dumping[11]. There are no plans to amend the London Convention to allow for CCS activities to take place. The Office for the London Convention and Protocol does not think amendments to the London Convention shall be necessary, because it believes that momentum will gradually shift towards the Protocol with new Parties acceding to it[12].

(iii) OSPAR

In the EU the most relevant regional convention concerning CCS is the OSPAR Convention, which governs the protection of the marine environment in the North-East Atlantic and North Sea. The EU is a contracting Party to the Convention and so are many of its Member States. Parties to the OSPAR Convention have considered the implications of CO_2 storage for a number of years, and in 2003 the OSPAR Commission requested a legal review from their advisory body, the Group of Jurists and Linguists[13]. This review concluded that OSPAR contained provisions which would potentially obstruct the employment of CCS technologies. Under the Convention the dumping of all wastes is prohibited, unless specifically listed in Annex II; none of which could be said to include CO_2. Unlike the London Convention, OSPAR covers polluting activities in the sub seabed and

[10] 1996 Protocol, Annex 2 and Article 4
[11] Article 15 of the Protocol cites established principles of international law as the basis for Contracting Parties to develop procedures for liability; where dumping has resulted in damage to the environment generally, or to that of other States. There is recognition that CO2 storage raises new issues concerning liability, particular over long periods of time, so special procedures may need to be introduced.
[12] Personal Communication: Mr. René Coenen, Office for the London Convention and Protocol, 28th August 2007.
[13] OSPAR Group of Linguists and Jurists, 'Compatibility with the OSPAR Convention of Possible Placements of Carbon Dioxide in the Sea or Sea-bed', May 2003.

subsoil which could present a strong argument to catch geological CO_2 storage projects, and also has certain restrictive provisions concerning pollution from land-based sources[14]. CO_2 delivered to an existing offshore installation by pipeline or ship and then injected, would therefore be usually viewed as dumping and prohibited under the Convention, although some CO_2 storage projects from offshore sources may be arguably permissible in some circumstances[15].

Following the internal legal review and also a number of studies examining the environmental implications of CO_2 sequestration[16], the OSPAR Commission decided to adopt amendments to the Convention in June 2007 to allow for CO_2 storage in sub-seabed geological formations (subject to fulfilment of certain conditions). This will bring it in-line with the provisions of the 1996 Protocol to the London Convention. The Commission further decided to legally rule out the placement of CO_2 into the water column of the sea and on the seabed because of 'potential negative effects'. France, as depository of this legislation is expected to begin the ratification process by corresponding with the Parties to the Convention in late 2007[17], although these amendments shall not come into force until the ratification process is completed in accordance with the Conventions provisions[18]. Amendment's to allow for inclusion of CCS in the 1996 Protocol were passed without any opposition, so the OSPAR amendments could theoretically also take place quickly.

The amendments to the Convention will introduce additions into Annex II and Annex III. In Annex II, a new subparagraph will be added to Article 3 which includes; '*(f) Carbon dioxide streams from carbon dioxide capture processes for storage, provided: i. Disposal is into a sub-soil geological formation; ii. The streams consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture, transport and storage processes used; iii. No wastes or other matter are added for the purpose of disposing of those wastes or other matter; iv. They are intended to be retained in these formations permanently and will not lead to significant adverse consequences for the marine environment, human health and other legitimate uses of the maritime area'*. This amendment includes CO_2 in the list of wastes or other matter that may be dumped in the marine environment; provided the CO_2 streams which are stored in this manner, meet the other preconditions listed in subsections (i) to (iv) above. Stored CO_2 streams may only be stored in accordance with an authorisation issued by the Parties' relevant authorities and carried out in accordance with their regulation. These authorisations and regulations must in turn, be '*in accordance with the relevant applicable criteria, guidelines and procedures adopted by the Commission*'[19].

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[14] OSPAR Convention, Annex I and Article 3 of the Convention

[15] There is a potential exclusion that allows for C02 that was piped to a new platform not previously used for hydrocarbon activities, because of the definition of 'offshore activities'. Operations involving enhanced oil or gas recovery also seem to be permissible under the Convention as drafted. See further: Purdy, R., and Macrory, R. (2004), *Geological carbon sequestration: critical legal issues*, Tyndall Centre for Climate Change Research Working Paper Number 45.

[16] OSPAR Commission, 'Effects on the Marine Environment of Ocean Acidification Resulting from Elevated Levels of CO_2 in the Atmosphere', Haughan, P.M., Turley, C. and Poertner, H-O., March 2006.
OSPAR Biodiversity Committee, OSPAR Commission and OSPAR Offshore Industry Committee (Reviewers), 'Placement of CO_2 in Subsea Geological Structures', A report prepared by Norway and the United Kingdom, March 2006.

[17] Personal Communication: Corinne Michel, Ospar Commission, 20th August 2007.

[18] OSPAR Convention, Article 15.

[19] OSPAR Convention, Article 4.1, Annex II

Annex III is also to be amended to accommodate CCS technologies; two new paragraphs are included under Article 3. The new paragraphs 3 and 4 provide; '*3. The prohibition referred to in paragraph 1 of this Article does not apply to carbon dioxide streams from carbon dioxide capture processes for storage, provided: (a) Disposal is into a sub-soil geological formation; (b) The streams consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture, transport and storage processes used; (c) No wastes or other matter are added for the purpose of disposing of those wastes or other matter; (d) They are intended to be retained in these formations permanently and will not lead to significant adverse consequences for the marine environment, human health and other legitimate uses of the maritime area. 4. The Contracting Parties shall ensure that no streams referred to in paragraph 3 shall be disposed of in sub-soil geological formations without authorisation or regulation by their competent authorities. Such authorisation or regulation shall, in particular, implement the relevant applicable decisions, recommendations and all other agreements adopted under the Convention'.* This amendment provides an exception for CCS activities, from the prohibition contained in Annex III, with regard to the dumping of wastes or other matter from offshore installations. However, these activities are required to meet the preconditions listed in subsections (a) to (d) and be stored in accordance with a relevant authority's authorisations and regulations.

At the meeting of the OSPAR Commission in June 2007, a further decision was adopted with regard to the regulation of the storage of CO_2 in geological formations. Decision 2007/2 states that the Parties' competent authorities are responsible for ensuring the correct regulations and authorisations are in place for CCS activities; and that these regulations and authorisations shall be made in accordance with specific OSPAR Guidelines[20]. Under these Guidelines, a decision to grant a permit for CCS activities may only be taken, once the competent authority is satisfied that there has been a suitable risk assessment and management process. The decision provides a list of items that are to be included as a minimum, in any permit or approval issued by the competent authority. Paragraph 3.2 of the Decision states; '*The provisions of the permit or approval shall ensure the avoidance of significant adverse effects on the marine environment, bearing in mind that the ultimate objective is permanent containment of CO_2 streams in geological formations*'. The Decision also requires Parties to notify the Executive Secretary of OSPAR, should they decide to issue a permit for CCS activities. The Secretary shall then send notification to all the other Parties. A Party is then obliged to provide a formal report at the next OSPAR subsidiary body meeting and for each subsequent year after that[21].

The Guidelines provide *'generic guidance'* for Parties and their relevant authorities, when they come to consider application for permits to undertake CCS activities. The Guidelines stress that although not all of their elements will be relevant to every project considered; Parties are obliged to ensure that they have been '*applied to the extent possible*' when considering applications. The Framework for Risk Assessment and Management of CO_2 Streams in Geological Formations (FRAM) forms a part of the Guidelines and provides Parties with an

[20] OSPAR Guidelines for Risk Assessment and Management of CO_2 Streams in Geological Formations

'*iterative process*' that should be used to ensure the continual improvement of a CCS project, throughout its lifetime.

3. Climate change legislation

(i) The United Nations Framework Convention on Climate Change and Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC), 1992, is of a framework nature and imposes a general requirement upon contracting parties' governments, to adopt policies and make various commitments towards the stabilisation and eventual reduction of greenhouse gas concentrations. The Kyoto Protocol was agreed in 1997 and provides signatory Parties' with actual legally-binding obligations and targets for the reduction of their greenhouse gas emissions. The Protocol shares the Convention's aims, principles and institutions, but requires developed countries (those listed in Annex 1) to reduce their emissions of greenhouse gases by at least 5% from 1990 levels in the commitment period 2008-2012. The Protocol must be read in conjunction with the UNFCCC, as discussed above; for the Convention is the 'parent law' and the definitions contained within in its articles are used in the Protocol.

The Protocol has attached a '*monetary value to the earth's shared atmosphere*'[22] with the restrictions it has placed upon greenhouse gas emissions. The introduction of mandatory emissions targets has meant that the there is a financial cost attached to the reduction of greenhouse gas emissions. Parties to the Convention will seek the most cost-effective methods for reducing their emissions; it is this element that is reflected in the creation of the flexible mechanisms. The UNFCCC and the Kyoto Protocol do not contain an explicit reference to the use of CCS, although proposed new accounting and inventory methodologies have gone some way toward its inclusion in the portfolio of climate change mitigation mechanisms.

(ii) Accounting Methodologies

The UNFCCC and Kyoto both require Parties to submit information regarding how they intend to meet their commitments and implement the requirements of the legislation. The Convention requires various national reports to be submitted[23] and Kyoto contains provisions requiring Parties to submit annual greenhouse gas inventories and communications demonstrating their compliance with the terms of the Protocol[24]. Under Kyoto, Parties are also required to instigate national systems, which shall estimate the emissions by various sources and the removals by 'sinks' of all greenhouse gases[25].

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[21] A report is required to be in the format specified in Appendix 1 to Decision 2007/2.
[22] UNFCCC website - http://unfccc.int
[23] UNFCCC, Article 12
[24] Kyoto Protocol, Article 7
[25] Kyoto Protocol, Article 5

The IPCC Guidelines for National Greenhouse Gas Inventories[26], which are used by the Parties for calculating and reporting national greenhouse gas emissions and removals under the Protocol; were first released in 1994 and a revised set was released in 1996. In 2005, however, an IPCC special report suggested that they were insufficient to address certain issues.[27] In April 2006 the IPCC adopted the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (hereafter the 2006 Guidelines), which contained for the first time, a complete methodology for the treatment of CCS activities.

Chapter 5 of the 'Energy' volume in the new 2006 Guidelines provides detailed guidance on emission estimations for capture and compression, transport systems, injection systems and the storage of CO_2. The Guidelines do not provide a methodology for storage options such as ocean storage or the conversion of CO_2 into other substances; nor do they address the emissions associated with the additional consumption of fossil fuels, for the various CCS processes.

The 2006 Guidelines have not yet been officially sanctioned by the official bodies of the Convention and Protocol (the Conference of the Parties (COP) and the Meeting of the Parties (MOP); although at the recent meeting of the scientific body that advises the official bodies (SBSTA), there was official recognition of the issue.[28] SBSTA stated that there '*was a need for continued consideration of the 2006 IPCC Guidelines in the context of the revision of the UNFCCC reporting guidelines for Annex 1 parties*'[29] and encouraged Parties to '*gain experience*' of the Guidelines and submit details of their experiences to the Convention Secretariat by February 2009. Further consideration of the issue has been scheduled for the 30th meeting of SBSTA, which is to be held in June or July of 2009.

In the absence of a final decision regarding the 2006 Guidelines, as discussed above, there is discussion as to whether individual parties may utilise these Guidelines instead of the revised 1996 Guidelines, in the preparation of their national inventories. It may be suggested that the official methodology for monitoring or reporting emissions, in the absence of an amendment or revision to the official guidelines, remains the 1996 Guidelines and their associated guidance. The United Kingdom, however, intends to use the 2006 Guidelines, to incorporate any CCS activities, on the basis that there is at present, no specific guidance in this area. The UK's Department for Environment, Food and Rural Affairs is of the view that the later Guidelines may be used, since they are the most relevant and up-to-date and there is currently a gap in the scope of the 1996 Guidelines, which is remedied by the later guidance[30].

[26] Available at www.ipcc.ch
[27] IPCC (2005), Carbon Dioxide Capture and Storage.
[28] SBSTA, Draft Conclusions proposed by the Chair, Agenda Item 7(a), Intergovernmental Panel on Climate Change guidelines for national greenhouse gas inventories, FCCC/SBSTA/2007L.5, Bonn, May 2007.
[29] Ibid
[30] Personal Communication, Defra, July 2007.

(iii) Flexible Mechanisms

The Protocol's flexible mechanisms allow parties to decide how they will best meet their reductions during the relevant commitment periods and effectively lower the cost of compliance with the targets issued. Under the Protocol, Annex 1 Parties may use two project-based mechanisms to fulfil their obligations under Kyoto. Joint Implementation (JI) allows an Annex 1 party to '*transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy*', provided that it '*provides a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur*'[31]. A Party may undertake an emission-reducing project, or a project that enhances removals by sinks, in the territory of another Annex I Party; Emission Reduction Units (ERUs) obtained in this manner may then be used to meet the original Party's Kyoto targets.

The Clean Development Mechanism (CDM) is another project-based mechanism which generates credits that may be used by Annex 1 Parties to meet their commitments under the Protocol. Article 12 provides that Certified Emission Reductions (CERs) shall be generated by CDM projects, which assist developing country Parties meet their emissions targets. Essentially, developed nations sponsor or pay for emission reduction projects in less affluent countries; in return for credits that they may put towards their own emissions targets.

Under the Protocol, Annex 1 countries are entitled to implement projects, which reduce their emissions at source. CO_2 capture projects could arguably generate Emission Reduction Units (ERUs) or Certified Emission Reductions (CERs); because captured CO_2, which does not find its way into the atmosphere, should be considered an 'emission reduction'[32]. The treatment of CCS under the CDM may be particularly significant, specifically whether units may be awarded for reductions made by CCS technologies and then traded by a Party to meet its commitments.

The inclusion of CCS in the CDM was considered by the CDM Executive Board[33]at its 22nd meeting, but it was felt that a workshop on the issue would be required to consider it in greater depth. The UNFCCC held a workshop on the topic in May 2006, in conjunction with the 24th session of SBSTA and here the main issues to be resolved were discussed[34]. The 'project boundary' of CCS projects, was of particular concern; in particular situations where a project's storage spans international boundaries, or instances of the multiple use of the same reservoir by various CCS projects. Another concern was how to account for the leakage of greenhouse gases resulting from the additional energy required capturing CO_2 in the first instance. The effect upon 'upstream' and 'downstream' emissions were also considered, as well as the overall loss of efficiency for power plants when

[31] Article 6, Kyoto Protocol
[32] See further: Purdy, R., '*Geological Carbon Dioxide Storage and the Law*', Chapter 4, in Gough, C. & Shackley, S. (eds.) in Capturing Carbon: The Prospects for Carbon Dioxide Capture and Storage in the UK, 2006, pp87-139, Ashgate.
[33] http://cdm.unfccc.int/index.html - Homepage of the Clean Development Mechanism on the UNFCCC website.
[34] Report on the workshop on carbon dioxide capture ad storage as clean development mechanism project activities, COP/MOP2, Agenda Item 5, FCCC/KP/CMP/2006/3, Nairobi, November 2006.

modified to incorporate CCS technologies. The permanence of stored CCS was also an important consideration for those at the workshop, as well as other associated issues which include; the selection site criteria to be used, what methods of storage are to be employed, monitoring methods and requirements and the liability mechanisms for any seepage of stored CO_2.

These issues and others, were then considered by the official body (COP/MOP) at its second session in Nairobi in November 2006[35], however a decision was not made as to whether CCS should be included in the CDM. A period of consultation on the issue was requested by the COP/MOP and is to conclude in September 2007; the results of which be made available for consideration by the Parties at the 27th meeting of SBSTA. The Scientific Body is then charged with preparing recommendations in readiness for COP/MOP3 in December 2007. A final decision, as to whether CCS should or should not be included, shall be made at COP/MOP4 in 2008.

(iv) Kyoto Project Mechanisms and the EU

The EU's greenhouse gas emission allowance trading scheme is the largest multi-country, multi-sector, emission trading scheme in the world. It began in January 2005 and covers approximately 50% of the EU's carbon dioxide emissions. The inclusion of CCS in the CDM, or indeed other project-based mechanisms under Kyoto, is of particular significance for operators in the EU; for the EU Linking Directive[36] amends the Emissions Trading Directive[37] to allow operators of installations to utilise credits generated under the Protocol to meet their commitments under the Directive. Emission Reduction Units (ERUs) and Certified Emissions Reductions (CERs), gained from projects undertaken as part of the Clean Development Mechanism and Joint Implementation, may be surrendered at the end of each compliance period and allow operators another option in the range of abatement opportunities.

The use of these credits shall not remain unfettered however; for the Linking Directive inserts references to the 'supplementarity principle' into the Emissions Trading Directive. The amended Article 30 of the Emissions Trading Directive provides that; '*The total use of ERUs and CERs shall be consistent with the relevant supplementarity obligations under the Kyoto Protocol and the UNFCCC and the decisions adopted there under*'. There is no agreed EU definition of 'supplementarity'; although the principle of supplementarity requires that the use of project based mechanisms is supplemental to action taken domestically. Member States are required, as part of their monitoring and reporting requirements, to report to the Commission every two years '*the extent to which domestic action actually constitutes a significant element of the efforts undertaken at national level, as well as the extent to which use of the project mechanisms is actually supplemental to domestic action*[38].' Guidance published by the Climate Change Projects Office in the UK suggests therefore, that since

[35] Report of the Conference of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol on its second session (COP/MOP2), Nairobi, November 2006.
[36] Directive (2004/101/EC)
[37] Directive (2003/87/EC)
[38] Directive (2004/101/EC), Article 30

there is no prescribed definition of the extent of supplementarity; '*it is in fact left to each member state to decide this on their own*'[39].

In the first phase of the EU Emission Trading Scheme (EU ETS) (2005-2007) only credits obtained through CDM based projects (CERs) may be used in the EU scheme. Under the Kyoto Protocol, JI project credits (ERUs) will only be issued for a crediting period starting after the beginning of the year 2008; accordingly ERUs shall not be eligible for use in the EU ETS until Phase II (2008-2012). The Directive also prohibits the use of CER of ERU credits, that are obtained from nuclear facilities, land use or land change.

It is important therefore, to establish whether or not CCS may be included in these project-based mechanisms, a decision that is not expected before COP/MOP4 in 2008. It is anticipated that the inclusion of CCS will bring many benefits to operators who also operate within the EU ETS; credits gained from these Kyoto project based mechanisms are likely be cheaper than the traditional EU allowances and the inclusion of these types of credits will allow operators, who invest in either JI or CDM projects, to comply with the requirements of the EU ETS in a more cost effective manner. The addition of CCS to the Kyoto project mechanisms and the subsequent use of those allowances in the EU ETS, may also assist operators with reducing the initial innovation costs associated with this technology.

4. The Development of EU and National Legal and Regulatory Frameworks

(i) European Energy Policy and CCS

In January 2007 the European Commission published its Communication entitled 'An Energy Policy for Europe'[40], which sets out its strategic energy objective and other measures, with a view to combating climate change and ensuring EU-wide energy security. One significant challenge considered by the policy, remains the reconciliation of two competing interests; the move towards a low-carbon economy and recognition of the fact that coal and gas will remain significant components in the EU's energy mix. One of the 'central pillars' of the energy policy is its focus upon accelerating the shift towards a low carbon economy and the increased annual research expenditure on low carbon and renewable technologies. In 2007 the Commission will also present its European Strategic Energy Technology Plan (SET Plan), setting out the necessary technologies and timescales for their achievement, which are aimed at achieving the EU's energy policy. The SET will aim to harmonise expenditure at national and EU level, as well set '*clear targets with precise roadmaps and milestones*'[41].

CCS has arguably risen in the EU's energy policy hierarchy to be on a par with renewables and nuclear; the EU's Energy Commissioner is reported to have said in July 2007 that: "*we can't address climate change in the*

[39] DTI in association with Defra (2005) The Linking Directive: Linking the Kyoto Protocol's Market Mechanisms to the EU's Emission Trading Scheme, A Climate Change Projects Office Guide.
[40] COM(2007) 1 Final.
[41] Ibid, at page 16.

short and medium term without CCS'[42]. The EU has highlighted the positive results of research and development projects into 'clean coal' and CCS technologies and has suggested that '*it is now time to focus on the development and industrial demonstration of integrated technological solutions, combining in an optimal way Clean Coal and CCS for near-zero emission power generation from coal*'[43]. CCS is viewed as a mechanism for enabling sustainable fossil fuel power generation; it is hoped that the coupling of CCS and clean coal technologies shall enable near-zero CO_2 emissions and cost-effectively ensure the EU's energy mix.

The EU's Communication on sustainable power generation[44] sets out the policy objectives and work schedules for the development of CCS technologies in the EU. During 2007, the Commission hopes to develop a mechanism that will support the design, construction and operation of up to 12 large-scale demonstration plants by 2015; an assessment of when coal and gas-fired power plants shall be required to install CCS technology will also be made. The Commission's work programme for 2007 also requires an assessment of the current regulatory system with regard to CCS.

(ii) Promotion of a Regulatory Framework for CCS at EU Level

The Second European Climate Change Programme (ECCP II), which was established by the Commission to prepare and examine future climate policy in the EU[45], has set up a Working Group on Carbon Capture and Geological Storage. The Working Group's mandate was to explore CCS as a mitigation option, part of which required them to '*[identify] regulatory needs and barriers and [explore] the elements of an enabling regulatory framework for the development of environmentally sound CCS*'.

The European Commission, the European energy industry, research community and non-governmental organisations established in 2005, the European Technology Platform on Zero Emission Fossil Fuel Power Plants (ETP ZEP), which aims to '*drastically reduce the environmental impact of fossil fuel use, particularly coal, aiming at highly efficient power generation plants with near-zero emissions*'[46]. The ETP ZEP has recognised the significance that CCS will play in achieving its objectives; both its Strategic Research Agenda and Strategic Deployment Documents emphasise the need to secure the immediate deployment of the technology and resolve the various regulatory impediments and uncertainties. To this end, the ETP ZEP has established the Task Force on Policy Regulation which will, amongst other duties, identify regulatory issues and work closely with the Commission to improve the regulatory framework for CCS.

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[42] Carbon capture and storage: The EU's new policy darling; *Energy Economist; 40; Issue 310; 1 August 200; McGraw-Hill, Inc.*
[43] Communication from the Commission, 'Sustainable power generation from fossil fuels: aiming at near-zero emissions from coal after 2020', COM(2006) 843 Final.
[44] Ibid
[45] Communication from the Commission, 'Winning the Battle Against Global Climate Change', COM(2005) 180.
[46] Outline Concept and Tentative Structure for the Technology Platform Zero Emission Fossil Fuel Power Plants'. European Commission, 2005.

The Working Group on Carbon Capture and Storage set up under the ECCP II, published a detailed report on the topic of regulation[47]; which was adopted in June 2006 and drew upon the discussions held at various sessions throughout 2006. Section 4 of the Report stressed the need for the development of both policy and regulatory frameworks for CCS and urged the Commission to undertake further research into the subject. The Working Group made numerous recommendations to the Commission and highlighted in particular the need to clarify EU legislation with regard to waste and water, with a view to negating particular 'unwarranted obstacles'. In addition to these recommendations, the Working Group highlighted four particular elements, which should be included in a regulatory framework for CCS; these included an assessment of environmental risks and impacts; a framework for the permitting of CCS activities; the inclusion of incentives for investment (with particular focus upon the EU Emissions Trading Scheme) and appropriate liability rules.

The Commission's Communication from early 2007[48] recognised the recommendations made by the Working Group and reiterated the need for a regulatory framework, which was based upon '*an integrated risk assessment for CO_2 leakage, including site selection requirements designed to minimise the risk of leakage, monitoring a reporting regimes to verify storage and adequate remediation of any damage that does occur*'[49]. The Communication sets out an action plan for the Commission in this area during 2007; which requires the development of a sound management framework for CCS. It is anticipated that once the framework is completed, it may be combined with changes to the '*existing environmental regulatory framework*', thus removing any barriers to CCS deployment. The Communication also recognises that an assessment will need to be made as to whether the existing regulatory instruments should be modified to incorporate CCS, or whether an entirely new and independent regulatory framework should be created.

(iii) The Proposed Regulatory Framework

The Second European Climate Change Programme Working Group meeting on CCS in May 2007, served as a medium to examine the issue of an enabling framework for CCS and in particular: '*consult on (i) the scope of the impact assessment, (ii) the identified options for managing risks, removing barriers and promoting development, and (iii) the possible outline of a regulatory framework*'. Prior to the meeting, two background papers on the impact assessment for the enabling legal framework were submitted to participants[50]. These papers focused upon many of the key issues, as well as making suggestions as to a suitable regulatory regime and incentivisation of the technology. The first paper[51] provided a comprehensive analysis of the current position with regard to CCS under EU legislation, as well providing choices for possible regulatory

[47] Final Report of Working Group 3: 'Carbon Capture and Storage, The Second European Climate Change Programme', as adopted on 1 June 2006.
[48] Communication from the Commission, 'Sustainable power generation from fossil fuels: aiming at near-zero emissions from coal after 2020', COM(2006) 843 Final.
[49] Ibid, at page 8.
[50] 'Choices for regulating CO2 capture and storage in the EU', Task 2, European Commission Discussion Paper, Zakkour, P., ERM, April 2007 and 'Incentivising CO2 capture and storage in the European Union' ,Task 3, European Commission Discussion Paper, Prepared by ERM, April 2007.

mechanisms. Regulatory powers in four areas are described as fundamental for the creation of a regulatory framework for CCS; risk assessment and management; verification and assurance; enforced closure and liability. The paper recommends that various regulatory amendments are required to enable CO_2 storage activities. Other pieces of legislation are described as potentially 'enabling' and; following modification, could serve to establish risk assessment and monitoring controls for CCS[52].

At the most recent meeting of the ETP ZEP Task Force on Policy and Regulation[53], a representative of the European Commission set out their current viewpoint with regard to the regulatory framework. The individual aspects of the CCS process, capture, transport and storage, have been considered separately. The Commission has suggested that no new regulation shall be required for the capture and transport aspects of the CCS process. The Capture process and associated installations could be managed under the Integrated Pollution Prevention and Control (IPPC) mechanism; a regulatory system that ensures particular installations maintain an integrated approach to the control of pollution and requires that a high level of protection for human health and the environment is achieved. It is anticipated that the majority of the installations that are likely to undertake this aspect of the process are already, or would constitute qualifying installations, and as a result the requirements of the IPPC Directive[54] would apply. The Commission has also anticipated that the transport aspect of the CCS process may be adequately managed through regulatory systems already employed by Member States. It is likely that CO_2 shall be transported by pipeline, for this is the most cost-effective method, the regulation of which is normally undertaken at Member State level.

The regulation of the storage aspect of CCS has remained an unresolved issue for the European Commission. At the June meeting of the Task Force it was suggested that the Commission would be in favour of creating a free standing Directive to regulate the storage process. The verification of storage sites also remains an outstanding issue; it was suggested at the meeting that a decision was to be made as to whether there would be decentralised verification at Member State level, or centralised verification at the EU level. At both the June meeting of the ET ZEP's Task Force and those previously, it was recognised that the EC legislation regulating liability, the EU ETS, waste, water and landfill may also need to be amended to incorporate CCS activities.

The incentivisation of CCS activities remained a key aspect of the development of this technology. The Commission has proposed to allow the 'opt-in' approach for the second phase of the EU ETS, which runs from 2008-2012. Under Article 24 of the EU Emission Trading Directive[55] Member States may seek to opt-in installations using CCS technologies; although the capture, transport and storage of CO_2 must be opted in together as one installation. When making an application for opt-in for the second phase, the Member State shall

[51] 'Choices for regulating CO2 capture and storage in the EU', Task 2, European Commission Discussion Paper, Zakkour, P., ERM, April 2007
[52] Ibid, at page 3.
[53] Minutes from Third Meeting of the ZEP Task Force on Policy and Regulation, 7 June 2007.
[54] Directive (96/61/EC)
[55] Directive (2003/87/EC)

also propose monitoring and reporting guidelines. Based upon these applications the Commission shall decide whether CCS can be included in the Scheme.

The Commission expects the inclusion of CCS in the EU ETS to address the issue of liability for non-local or global damage. Inclusion in the EU ETS would potentially see captured CO_2 as not-emitted, thus an operator would not be required to surrender allowances for CO_2 that is transported and stored. However, any emitted CO_2 will require an operator to surrender allowances to the value/amount emitted; this it is suggested '*inherently creates a remediation obligation in respect of the global impact of emissions and also serves to maintain the environmental integrity of the EU ETS*'[56].

The Environmental Liability Directive[57] it is suggested would regulate damage caused to the local environment. The Commission has previously suggested that the Directive would apply strict liability to all operators of sites that are covered by the IPPC system[58].

The amendment of various other Directives has been discussed and the Commission has acknowledged that some key Directives will be affected[59]. The Waste Framework Directive[60], which aims first to prevent and reduce waste and second to promote the recovery and recycling of waste materials, contains a definition of waste which excludes from its scope, '*gaseous effluents emitted into the atmosphere*'[61]. Captured CO_2 therefore falls within the Directive's scope as waste; the effect of this classification is that injection and storage undertakings will require permits, in accordance with the provisions of the Directive.

The 2007 report prepared for the Commission[62] cites the Landfill Directive as an obstacle to CCS injection and storage activities. The report suggested that it remained uncertain as to whether CO_2 injection and storage constituted 'landfill', within the definition provided in the Directive and that it was not clear as to whether in certain forms it may be judged a 'liquid'[63]. These definitions remain critical, for in many instances CO_2 is injected in a liquid form and the Directive bans the landfilling of all liquid wastes.

The Water Framework Directive[64], which aims to establish a framework for the protection of surface waters, coastal waters and groundwater, may also require amendment. Under Article 11 of the Directive, the direct discharge of pollutants into groundwater is prohibited; the article also requires prior regulation, with associated

[56] 'Choices for regulating CO2 capture and storage in the EU', Task 2, European Commission Discussion Paper, Zakkour, P., ERM, April 2007 and 'Incentivising CO2 capture and storage in the European Union' ,Task 3, European Commission Discussion Paper, Prepared by ERM, April 2007.
[57] Directive (2004/35/EC)
[58] Minutes from Second Meeting of the ZEP Task Force on Policy and Regulation, 19 April 2007.
[59] Ibid.
[60] Directive (75/442/EEC) (As amended)
[61] Ibid, Article 2(1)(a)
[62] 'Identification of gaps and obstacles for CCS in existing legislation', Prepared for the European Commission by ECN, Norton Rose, gig and ERM, February 2007.
[63] Ibid, at paragraph 7.9.7.
[64] Directive (2000/60/EC)

emissions controls, for point source discharges that may cause pollution. The Directive allows Member States however, to authorise certain discharges into geological formations; provided they do not jeopardise the environmental objectives, which were established for that particular body of groundwater. Currently, none of these exceptions address the injection of CO_2, however this section could be modified for its inclusion.

(iv) Moving the Framework Forward

There appears to be a clear consensus as to what is required generally, namely a dedicated legal framework of some sorts; but the actual content and format is still being discussed and refined. The final content of the Commission's proposed regulatory structure is not due to be published until the end of 2007 and this paper has therefore, highlighted the key areas and issues that the Commission appears to be focussing upon and those areas of the law which are likely to be included in the final legislation. It would seem that the regulatory system for CCS activities will be required to serve a dual purpose; to provide a suitable regulatory regime for the operation of installations and to incentivise the technology. When discussing the myriad of legislation, which may or may not affect CCS; the various working parties and meetings have spent a great deal of time analysing the legal issues that will affect the financing of these activities. The inclusion of CCS in the EU ETS is a clear example, and many commentators have recognised that this shall prove fundamental if financing is to be secured for this industry and it shall remain a financially viable option.

5. Conclusion

Whilst many countries are developing a strong interest and profile in the potential of CCS, the EU and its Member States have arguably stolen a march in taking the international lead in embracing CCS. It is clear from this analysis that there is recognition of the significance of this technology within the EU's energy policy, and recent commitments to help promote the development of demonstration plants by 2015 clearly reveal this.

Firm policy drivers at EU and Member State level have also encouraged the removal of obstacles to CCS within existing legal frameworks at both international and regional level, providing greater certainty to proceed with demonstration projects and financial planning for fully operative storage sites. The rapid legislative changes to allow for offshore CCS under the 1996 Protocol to the London Convention and the expected amendments to the OSPAR Convention, have meant that there are few significant obstacles within international and regional marine laws to the widespread deployment of this technology.

The status of CCS under the UNFCCC and Kyoto Protocol has for a long time remained uncertain, with neither specifically allowing or prohibiting the technology. Whilst there appears to be no plans to make legislative changes to accommodate CCS, it seems Parties to these agreements have increasingly recognised the significance of these technologies and have sought clarification as to their treatment under the international climate regime. When approved, the IPCC's 2006 Guidelines for monitoring and reporting emissions will

formally recognise CCS as a mitigation option for the first time and provide a complete methodology for the management of CCS activities. The proposals to include CCS in the flexible mechanisms created by the Protocol will also be significant for industrialised Parties to the Protocol; for its inclusion could allow them to make cost-effective and flexible emissions reductions.

In parallel to developments under the marine and climate change regimes, the EU has focussed upon giving strong commitments to creating an enabling CCS legislative framework at European level. The most recent proposal from the European Commission[65] suggests that no homogenous legislation will be required for the regulation of the capture and transport of CO_2, the rationale being that regulation may be adequately covered by amending existing legislation. The Commission appears to have decided that a free standing directive will only be needed to regulate the storage of CO_2, however the exact format and content of the legislation has yet to be revealed in any publicly available documents. In addition to the regulatory framework, the 'incidental' amendment of a number of other environmental Directives may also be required. This will assist in removing any remaining legislative obstacles to the deployment of CCS activities within Europe.

It is an interesting time for those who have championed the advancement of this technology. Swift responses at international and European levels in considering the case for CCS and removing barriers, may present various opportunities sooner than expected. The pace of legal development illustrates a strong policy backing coupled with the recognition of market potential; but whilst the commitment to adopting CCS at EU and international levels is gaining momentum, it may take many more years before all the outstanding legal issues are fully addressed and a workable regulatory scheme is implemented.

Another key issue, which remains unresolved, is public confidence in any proposed regulatory regime and the technology itself. The public internet consultation held by the European Commission[66] in January this year; demonstrated broad support for CCS, but also recognised that there was a continued need for dialogue and information sharing.

[65] Minutes from Third Meeting of the ZEP Task Force on Policy and Regulation, 7 June 2007.
[66] 'Capturing and storing CO2 underground – Should we be concerned?, European Commission consultation, available at http://ec.europa.eu/environment/climat/ccs/consult_en.htm.