

CARBON CAPTURE AND STORAGE IN THE SKAGERRAK/KATTEGAT REGION - LEGAL ISSUES

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1. Introduction

This paper aims to identify potential legal obstacles, or uncertainties, that may affect the safe deployment of CCS in the Skagerrak/Kattegat-region. Where feasible, appropriate remedies are also discussed.

Capture, transport, and in particular storage of CO₂ are novelties to most legal systems, particularly if conducted on a large scale and outside the ambit of the oil and gas industry. Although there is some experience of regulating large-scale CCS activities in Norway, those activities differ in many ways from the integrated CCS network modelled in this project. The focus here is not primarily on the oil and gas industry, or on one particular State. Rather, what characterizes the project is the need to coordinate actors from different sectors, and to manage activities that cross national borders, and thereby jurisdictions.

CCS activities in the Skagerrak/Kattegat region will be affected by international-, EU-, and domestic law, and to some extent by regional or local rules and regulations. The focus here is mainly on EU law and domestic laws in Denmark, Norway and Sweden, since those will be most influential in shaping the conditions for CCS. However, initially some remarks will be made on aspects of international law that will be significantly for CCS in the region.

1.1. International framework

On the international level rather extensive assessments of existing rules have been made, mainly aimed at identifying potential obstacles to the deployment of CCS. Some obstacles to sub-seabed storage of CO₂ have been removed by amendments to existing agreements. This includes amendments to the London Dumping Protocol¹ and the OSPAR Convention,² both dealing with the fact that storage of CO₂ in the sub-seabed has, in most cases, been viewed as dumping, and thus been prohibited. The Parties to the London Protocol adopted an amendment in 2006, which made sub-seabed storage of CO₂ consistent with the Protocol and subject to a permit requirement under domestic law.³ A risk

¹ The full name of the Protocol is Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London, 7 November 1996).

² The full name of the Convention is Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) (Paris, 22 September 1992).

³ Resolution LP.1(1) on the Amendment to Include CO₂ Sequestration in Sub-Seabed Geological Formations in Annex 1 to the London Protocol (2 November 2006). The amendment entered into force in early 2007. 'Report of the Twenty-ninth Consultative Meeting and the Second Meeting of the Contracting Parties' (14 December 2007), LC 29/17, para. 4.1. Also under UNCLOS dumping may not be allowed without permission from a competent authority. UNCLOS, Article 210 (3).

assessment and management framework for sub-seabed CO₂ sequestration (i.e. storage)⁴ has been developed to guide the Parties in characterizing risks to the marine environment and to address uncertainties and residual risks.⁵ Subsequently specific guidelines for assessment of CO₂ streams have also been adopted.⁶ The Parties to the regional OSPAR Convention,⁷ aimed at protecting the environment of the North-East Atlantic, have taken a similar step, deciding in 2007 to amend the pertinent annexes so as to enable CO₂ storage in the sub-seabed.⁸ The OSPAR Parties, like those to the London Protocol, have adopted guidelines on risk assessment and management of CO₂ storage activities.⁹

A remaining problem of particular relevance to the establishment of a CCS structure in the Skagerrak/Kattegat region is the fact that Article 6 of the London Protocol prohibits the export of wastes or other matter from Parties to other countries for dumping at sea. This has given rise to a number of questions, including whether the prohibition applies to shipments between Parties or only between Parties and non-Parties. These and other issues have been addressed by a legal and technical working group whose view was that export is prohibited to Parties as well as non-Parties.¹⁰ In October 2009 the Parties adopted an amendment to Article 6. It enables the export of CO₂ streams for geological storage, provided that the countries concerned have entered into an agreement or arrangement.¹¹ To enter into force the amendment needs formal acceptance by 27 out of the 40 parties to the Protocol. In May 2011 only Norway had submitted such an acceptance. According to the IEA only about half of the parties are engaged in CCS development through international forums, and even among those that take an active interest in the promotion of CCS technologies not all have an interest in offshore CO₂ storage or transboundary movement of CO₂ for such storage. Ratification of the amendment may thus have a low priority in many of the parties to the convention.¹²

This makes it hard to predict if and when the amendment will take effect. Until then export of captured CO₂ from Sweden or Denmark to Norway for sub-seabed storage remains prohibited under international law. Therefore, this calls for intensified efforts, by those supportive of regional CCS solutions, to bring this issue higher on the international political and diplomatic agenda, and to engage

See further R. Purdy and I. Havercroft, 'Carbon Capture and Storage: Developments under European Union and International Law', 4:5 *Journal for European Environmental and Planning Law* (2007), p. 353, at 355.

⁴ For a critique of the use of 'storage' in EU-law to describe the pumping of CO₂ streams into e.g. saline aquifers in the deep seabed, see D. Langlet, 'Resting in Peace? Regulating the Geological Storage of Radioactive Waste and Carbon Dioxide: Swedish and European Perspectives,' 1:4 *Risk, Hazards & Crisis in Public Policy* (2010), pp. 111-137.

⁵ 'Risk Assessment and Management Framework for CO₂ Sequestration in Sub-seabed Geological Structures (CS-SSGS)', Annex 3 to 'Report of the Meeting of the SG Intercessional Technical Working Group on CO₂ Sequestration', LC/SG-CO2 1/7 (3 May 2006). The Framework was endorsed by the Parties in 2006. See 'Report of the Twenty-Eighth Consultative Meeting and the First Meeting of the Contracting Parties', LC 28/15 (6 December 2006), para. 75.

⁶ LC 29/17, n. 3 above, para. 4.13. The 'Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-Seabed Geological Formations' are set out in Annex 4 to the report.

⁷ Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) (Paris, 22 September 1992).

⁸ OSPAR Decision 2007/2 on the Storage of Carbon Dioxide Streams in Geological Formations.

⁹ Framework for Risk Assessment and Management of Storage of CO₂ Streams in Geological Formations (FRAM), found in OSPAR Guidelines for Risk Assessment and Management of Storage of CO₂ Streams in Geological Formations, Annex 1 in Meeting of the OSPAR Commission, Ostend, 25–29 June 2007, Summary Record, OSPAR 07/24/1-E (29 June 2007).

¹⁰ 'Report of the 1st Meeting of the Legal and Technical Working Group on Transboundary CO₂ Sequestration Issues' (3 March 2008), LP/CO2 1/8.

¹¹ Resolution LP.3(4) on the amendment to Article 6 of the London protocol, adopted on 30 October 2009. Particular obligations apply to export to states that are not parties to the London protocol. Those, however, are not relevant here since Denmark, Norway and Sweden are all parties.

¹² Carbon Capture and Storage Legal and Regulatory Review (CCS Review), 2nd ed., May 2011, OECD/IEA, 2011, p. 15.

constructively with those, particularly developing countries, that have expressed concerns regarding negative impacts from this liberalization of international dumping regulation.¹³

Overall, the approach of international law to CCS is patchy and far from comprehensive.¹⁴ The ensuing legal fragmentation may hamper the safe deployment of CCS technology internationally. In the regional context, however, the implications of this are limited by the common standards adopted by the EU.

1.2. The CCS directive and other EU-law on CCS

In April 2009 the European Parliament and the Council adopted the main piece of EU legislation on CCS, the so-called CCS Directive on the geological storage of CO₂ (2009/31/EC).¹⁵ As further discussed below, the directive should eventually come to apply also to EFTA-States, like Norway.

The Directive establishes a legal framework for the environmentally safe geological storage of CO₂ to contribute to the fight against climate change. The purpose of such storage is defined as ‘permanent containment of CO₂ in such a way as to prevent and, where this is not possible, eliminate as far as possible negative effects and any risk to the environment and human health.’¹⁶

The Directive applies to geological storage of CO₂ in the territory of the States concerned, their exclusive economic zones and on their continental shelves.¹⁷ This covers areas within 200 nautical miles, i.e. approximately 370 km, from the coast (when geography so allows).¹⁸ CO₂ may not be stored in a storage site with a storage complex – i.e. the storage site itself and any secondary containment formations – extending beyond this area. Storage of CO₂ in the water column is prohibited. Storage of CO₂ with a total intended storage below 100 kilo tonnes, undertaken for research, development or testing of new products and processes, is not covered by the Directive.¹⁹

The CCS Directive deals mainly with the storage phase of CCS. However, the adoption of the Directive also entailed amendments to a number of other EU legal acts in order to make them apply to, and accommodate, various aspects of CCS. These include Directive 85/337/EEC on Environmental Impact Assessment (EIA),²⁰ Directive 2008/1/EC on integrated pollution prevention and control (IPPC),²¹ Directive 2006/12/EC on Waste (subsequently replaced by 2008/98/EC)²², and Directive

¹³ The amendment to Article 6 of the London Protocol was primarily supported by OECD States. China voted against the amendment, while Kenya, the Marshall Islands, Mexico, Saudi Arabia, South Africa and Vanuatu abstained.

¹⁴ See further D. Langlet, ‘Safe Return to the Underground? The Role of International Law in Subsurface Storage of Carbon Dioxide’, 18 (3) *Review of European Community and International Environmental Law* (2009), pp. 286-303.

¹⁵ Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (Text with EEA relevance), OJ L 140, 5.6.2009, p. 114.

¹⁶ Directive 2009/31/EC, Article 1.

¹⁷ These terms are defined in the UN Convention on the Law of the Sea (UNCLOS), Montego Bay, 10 December 1982.

¹⁸ The continental shelf may extend beyond this limit, but since that is not relevant in the context of this study, it is not further discussed here.

¹⁹ Directive 2009/31/EC, Article 2.

²⁰ Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, OJ L 175, 5.7.1985, p. 40.

²¹ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (Codified version) (Text with EEA relevance), OJ L 24, 29.1.2008, p. 8.

²² Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste (Text with EEA relevance) OJ L 114, 27.4.2006, p. 9 has subsequently been repealed and replaced by Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance), OJ L 312, 22.11.2008, p. 3.

2004/35/EC on Environmental Liability.²³ In a separate but coordinated process amendments were made to the Emissions Trading Directive 2003/87/EC (the Trading Directive) with the effect that CO₂ captured for geological storage in accordance with the CCS Directive is not to be considered as emitted under the cap and trade system.²⁴ Any subsequent emission from any part of the CCS chain must instead be covered by emission allowances. This is further discussed below in the section on responsibility under EU ETS.

The directive on EIA has been amended so that an impact assessment is required for a number of CCS-related activities, with or without transboundary effects.²⁵ CO₂ captured and transported for the purpose of storage according to applicable EU law has been excluded from the EU legislation on waste and shipments of waste.²⁶

The CCS Directive, as well as the IPPC-, waste-, EIA- and environmental liability directives, are based on the EU's environmental policy and only establish minimum harmonization.²⁷ They leave individual Member States free to impose more stringent protective measure on operators under their jurisdiction, as long as those measures pursue the same objectives as the pertinent EU directive(s).²⁸

The Marine Strategy Framework Directive from 2008 requires EU Member States to carry out a series of measures, including adoption of environmental targets, monitoring programmes, and programmes of measures, aimed at achieving 'good environmental status' by 2020.²⁹ National measures that will be taken to comply with the Directive may affect marine CCS activities. Since the Directive grants Member States considerable discretion in devising appropriate measures, it is hard to foresee what specific impacts they may have. Programmes of measures are only required to be developed by 2015.³⁰

1.3. Implementation of the CCS directive in domestic law

The fact that the CCS Directive is a directive, as opposed to an EU regulation, means that it has to be implemented in the national legal orders. Directives are binding upon the Member State as to the result to be achieved, but leave to the national authorities the choice of form and methods.

The implementation of a directive into domestic law does not necessarily require that its provisions be incorporated formally and verbatim in express, specific legislation; a general legal context may be

²³ Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, OJ L 143, 30.4.2004, p. 56.

²⁴ Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (Text with EEA relevance), OJ L 140, 5.6.2009, p. 63.

²⁵ Directive 2009/31/EC, Article 31 amending Annexes I and II to Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, [1985] OJ L 175/40.

²⁶ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste, [2006] OJ L 114/9, Article 2 (1) (a) as amended by Directive 2009/31/EC, Article 35.

²⁷ This follows from the directives being based on Article 175 of the EC treaty (now Article 192 of the Treaty on the functioning of the European Union, or TFEU). National legislation must, however, be compatible with the general rules on free movement of the TFEU. Article 193 TFEU.

²⁸ On the meaning of 'more stringent protective measure' see case C-6/03, *Deponiezweckverband Eiterköpfe* [2005] ECR I-2753.

²⁹ Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (Text with EEA relevance), OJ L 164, 25.6.2008, p. 19.

³⁰ Directive 2008/56/EC, Article 5.

adequate provided that it does indeed guarantee the full application of the directive in a sufficiently clear and precise manner.³¹

Implementation of the CCS directive in the legal orders of the EU Member States was to be completed no later than 25 June 2011.³² However, unlike Denmark Sweden had still not taken any substantive measures to implement the Directive in November 2011.

The Swedish government presented draft implementation measures in late 2010 which can be described as minimalistic, i.e. they reveal little intention at this stage to take any measures that are not required by EU-law. The proposal describes the CCS Directive as partly a framework that will have to be gradually filled, e.g. by judicial decisions and national rules.³³ However, by including the authorization procedure for storage sites in the Environmental Code (1998:808), the Swedish legislator will make a number of general requirements, e.g. regarding siting, applicable.

The Danish implementation procedure reveals a somewhat more active attitude towards CCS. It resulted in May 2011 in the adoption of an amendment to the Sub-soil Act (Undergrundsloven).³⁴ These (proposed) national rules will be further discussed below in relation to particular CCS activities.

For members of the European Free Trade Association (EFTA), such as Norway, the Directive may become binding by its inclusion in the European Economic Area (EEA) Agreement between the EFTA States and the EU. Although the CCS Directive has yet to be added to the EEA-agreement, it has been identified as EEA-relevant and Norway is in the process of implementing it. The implementation measures are expected to include a new regulation on transport and storage of CO₂ in sub seabed reservoirs on the continental shelf. Particular regulation is also expected with respect to health and safety in relation to transport and storage. The current Norwegian CCS activities at Sleipner and Snøhvit are subject to authorization and oversight in accordance with the Oil Law (Petroleumsløven)³⁵ and the Pollution Control Act (Forurensningsloven)³⁶. These are expected to form the basis also for the new regulation.³⁷ The implementation deadline of June 2011 does not apply to Norway. EFTA States typically get one to two additional years for implementing directives.³⁸

The problems that may follow from differences in regulatory approaches and political commitment to CCS are further discussed below.

1.4. Issues not covered by the CCS Directive

Although the CCS Directive and the amendments to other legislation, which it stipulates, establish a legal frame for CCS activities in the States concerned, there are significant issues, which remain outside the preview of EU law. This goes for many aspects of liability.³⁹ Under the Environmental

³¹ Case C-131/88. *Commission s v Federal Republic of Germany*, ECR 1991 p. I-00825, para. 6.

³² Directive 2009/31/EC, Article 39.

³³ Swedish Government, Promemoria, Geologisk lagring av koldioxid, p. 85.

³⁴ Lov om ændring af lov om anvendelse af Danmarks undergrund, LOV nr 541 af 30/05/2011.

³⁵ LOV 1996-11-29 nr 72: Lov om petroleumsvirksomhet.

³⁶ LOV-1981-03-13-6: Lov om vern mot forurensninger og om avfall.

³⁷ Fullskala CO₂-håndtering, Meld. St. 9, (2010–2011), p. 25.

³⁸ T. Eilertsen, 'Tredjepartsadgang til transportnett og lagringsområder for CO₂ - implementering av Europaparlaments- og rådsdirektiv om geologisk lagring av CO₂ i norsk rett', *Marlus* no 392, 2010, p. 14.

³⁹ On different aspects of liability see for example M. Griffiths, *Policy Option Paper -Closing the Liability Gap*, The Pembina Institute and Institute for Sustainable Energy, Environment and Economy, (Alberta, 2008) p. 3, (<http://pubs.pembina.org/reports/ccs-policy-liability-gap.pdf>), M. Figueiredo, *The liability of Carbon Dioxide Storage*, PhD thesis, Massachusetts Institute of Technology: 2007, p. 51, (<http://esd.mit.edu/people/dissertations/defigueiredo.pdf>), M. Elkington, *Options for managing liability in CCS projects* (Marsh & McLennan Companies, 2007), (http://www.iea-coal.org.uk/publishor/system/component_view.asp?LogDocId=81736&PhyDocId=6383)

Liability Directive operators of storage sites are required to take, and bear the costs for, preventive as well as remedial action with respect to environmental damage⁴⁰ caused or threatened by a CO₂ storage site.⁴¹ However, liability for harm to humans or property, as well as for the damage caused by CCS-activities other than storage, such as transport or injection, is left to the individual States to deal with.⁴² Access to land for transport infrastructure and storage sites are also not covered by EU law. The same goes for spatial planning. In these cases national rules and principles will continue to apply.

2. Regulation of CO₂ capture

The capture phase of CCS has by the EU commission been deemed not to include any element which cannot be managed within the frame of existing EU law. Most importantly, the IPPC and EIA Directives were found adequate to regulate CO₂ capture with minor adjustments.⁴³ Whether CO₂ compression and the presence of compressed CO₂ in large quantities should motivate specific regulation is to be further assessed.⁴⁴ Outside the ambit of EU-law falls, inter alia, planning law measures, such as building permits, which may be necessary for capture installations. Those, however, do not pose novel challenges to industry compared to more conventional activities. Only a few remarks will therefore be made on the regulation of capture.⁴⁵

Directive 2001/80/EC on emissions from large combustion plants requires operators of new combustion plants (i.e. plants for which a construction license is granted after May 2009) with a rated electrical output of 300 megawatts or more to assess whether: suitable storage sites are available; transport facilities are technically and economically feasible; and whether it is technically and economically feasible to retrofit for CO₂ capture. If these conditions are met, the competent national authority must ensure that suitable space is set aside on the installation site for the equipment necessary to capture and compress CO₂.⁴⁶ Currently there is no requirement that such equipment actually be installed. However, the inclusion of such a requirement is still an option. If the safety and economic feasibility of geological CO₂ storage is deemed to have been demonstrated, the EU commission shall examine and report in March 2015 on whether it is needed and practicable to establish mandatory emission performance standards for new electricity-generating large combustion installations.⁴⁷ Such performance standards could in effect make CCS compulsory for certain such installations.

and M. Bergsten, 'Environmental Liability Regarding Carbon Capture and Storage (CCS) Operations in the EU' in *European Energy and Environmental Law Review*, 20 (3) (2011) pp. 108-115 ,
(http://journals1.scholarsportal.info/details.xqy?uri=/09661646/v20i0003/108_elrccasoite.xml).

⁴⁰ Environmental damage does not include all damage to the natural environment. It covers *inter alia* damage to protected species and natural habitats and land contamination. Damage to the quality of certain waters is also covered. Directive 2004/35/EC, Article 2 (1). However, with respect to the sea, the directive is only concerned with 'coastal waters' defined as 'surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured'. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, [2000] OJ L 327/1, Article 2 (7).

⁴¹ Directive 2004/35/EC, Articles 5 and 6.

⁴² Through Directive 2009/31/EC, preambular para. 34.

⁴³ The adjustments were made by Articles 31 and 33 of Directive 2009/31/EC.

⁴⁴ Accompanying Document, 23.1.2008, SEC(2008) 54, section 4.2.

⁴⁵ See further D. Langlet 'Europeisk reglering av koldioxidlagring: analys utifrån miljörettsliga aspekter', 1 *Nordisk Miljörettslig Tidskrift* (2009), p. 83 et seq.

⁴⁶ Directive 2001/80/EC, Article 9a. The requirement applies to plants for which the original construction license, or the original operating license, is granted after May 2009.

⁴⁷ Directive 2009/31/EC, Article 38 (3).

As an example, the proposed Swedish implementation measures do not impose any additional obligations in this respect and stick with the 300 megawatt threshold.⁴⁸

When CO₂ is captured from an installation which in itself is subject to compulsory EIA under EU law – e.g. thermal power stations and other combustion installations with a heat output of 300 megawatts or more – the capture installations will also require an EIA. The same applies to other capture installations if the total yearly capture is 1,5 megatonnes or more.⁴⁹ Regarding capture of CO₂ from installations that do not in themselves require an EIA, and where the total yearly capture is less than 1,5 megatonnes, States must themselves determine whether an EIA is necessary, either based on a case-by-case examination, or by thresholds or criteria that they set.⁵⁰

When capture is made from an installation that falls under the IPPC-Directive – inter alia combustion installations with a rated thermal input exceeding 50 MW and oil and gas refineries – the capture will itself be subject to that Directive.⁵¹ That entails requirements that, among other things, the best available techniques (BAT) be used to prevent pollution, that no significant pollution must be caused, and that energy must be used efficiently.⁵² The carrying out of an EIA as a prerequisite for obtaining a permit is an ordinary procedure for large industrial operations but may obviously add to the time needed to get a capture process up and running. However, compared to the time which is likely to be needed for obtaining authorization for transport and storage operations that should not to be a major issue.

3. Regulation of CO₂ storage sites

Due to its novelty and complexity, the storage phase of CCS is likely to pose the largest challenge in the CCS chain. The pertinent EU guidelines stress that the geological storage is where most of the uncertainty and risk lies in any integrated CCS project, inter alia due to uncertainty regarding geological processes and current day conditions in the subsurface.⁵³ Key to safe and efficient regulation and supervision of storage operations is likely to be continuous and open dialogue between operators and regulators, as well as extensive knowledge-sharing among all stakeholders. Responsible authorities must be cautious not to be – or be seen as being – too closely involved with operators, while at the same time acknowledge that the data produced and experiences gained by the operators will be of fundamental importance to their regulatory and supervisory activities.

It must also be recognized that while the quality of the supervision and decision-making by responsible authorities to a large extent is dependent on careful monitoring and diligent reporting by the operator, that same operator has a significant economic incentive not to register and report leakage of CO₂, since that will entail costly responsibility under the ETS.

This should necessitate considerable commitment to monitoring by the authorities, or at least by agents independent from the operator. It also calls for constructive dialog and transparency regarding how the operator organizes monitoring and internal and external reporting.

⁴⁸ Promemoria, note 33 above, p. 83.

⁴⁹ Directive 85/337/EEG, Annex I, point 24 (as amended through directive 2009/31) and Article 4(1).

⁵⁰ Directive 85/337/EEG, Annex II, point 3 (j) (as amended through directive 2009/31) and Article 4(2).

⁵¹ Directive 2008/1/EC, Annex I, point 6.9.

⁵² Directive 2008/1/EC, Article 3 (1). Regarding ‘pollution’ see further, Article 2, point 2.

⁵³ Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: Characterisation of the Storage Complex, CO₂ Stream Composition, Monitoring and Corrective Measures, Guidance Document 2, European Communities, 2011, p. 4.

The CCS Directive recognizes the unconditional right of each Member State to decide whether it accepts the siting of any CO₂ storage within its territory.⁵⁴ In practice the same should apply to storage within a Member State's exclusive economic zone at sea, although the situation there is slightly more complex.⁵⁵ For any State that accepts in principle such storage within its territory, or under its jurisdiction at sea, there are EU law requirements, inter alia, on the siting, and on the permit that will be required.

3.1. Substantive requirements

A fundamental obligation of the CCS Directive is that a geological formation⁵⁶ may only be selected as a storage site, 'if under the proposed conditions of use there is no significant risk of leakage, and if no significant environmental or health risks exist'.⁵⁷ Although the Directive provides a definition of 'significant risk', it is too opaque to provide much guidance.⁵⁸ There are, however, certain criteria for assessing the suitability of geological formations for use as storage sites.⁵⁹ How the fundamental

⁵⁴ Directive 2009/31/EC, Article 4.

⁵⁵ The CCS-directive is silent on the situation in the EEZ. There is currently no provision in EU law which would make decisions on storage in the EEZ subject to EU competence. It is rather in relation to other States that some room for interpretation may apply. It is, however, clear from the Law of the sea convention (UNCLOS) that coastal States have sovereign rights with regard to all activities for the economic exploitation and exploration of the zone. They also have an exclusive right to construct and to authorize and regulate the construction, operation and use of installations and structures for all economic purposes in the zone. Whether CO₂ injection is in fact 'economic exploitation' is not obvious in all circumstances, but with the exception of pure research projects it is hard to see how an CO₂ storage operation could be considered non-commercial if the incentive for its operation is that industry wants to avoid purchasing emission allowances (or sell allowances that have been provided for free) on the market by instead having the CO₂ stored. An argument can also be made for viewing geological formations suitable for storage as natural resources over which the coastal State also has sovereignty within its EEZ. (UNCLOS, Articles 56 and 60). For the same conclusion see G. Haver and H.C. Bugge, 'Transboundary Chains for CCS: Allocation of Rights and Obligations between the State Parties within the Climate Regime', 4:5 *Journal for European Environmental and Planning Law* (2007), p. 371. It has been argued that CO₂ storage should not—despite the considerable activities on the surface and in the water column that will be needed—be deemed to fall under the regime for the EEZ, but rather be regulated exclusively by the regime for the continental shelf. See M. Brus, 'Challenging complexities of CCS in Public International Law' in *Legal Design of Carbon Capture and Storage* by M. M. Roggenkamp and E. Woerdman (ed.) Intersentia, 2009, pp. 19–60, at p. 31. In that case the question is whether formations suitable for storage should be seen as natural resources. If not, the coastal State will not have the exclusive right to regulate such activities. However, it does have the exclusive right to authorize and regulate drilling on the continental shelf for all purposes. That would seem in effect to preclude any CO₂ storage on the continental shelf without the authorization of the coastal State. It is also clear that the CCS Directive is premised on the assumption that the coastal State has the exclusive right to authorize storage in the EEZ. How could it otherwise ensure, as it is obliged to according to Article 6 of the Directive, that that no storage site is operated without a storage permit in the area to which the Directive applies? Sub-seabed storage of CO₂ may also, as has been discussed above in relation to international marine law, be classified as dumping. Also in that case, however, can the coastal State exercise control over the activity since dumping within the EEZ or onto the continental shelf may only be carried out with the express prior approval of the coastal State (UNCLOS, Article 210). This is the ground provided by the Swedish legislator for subjecting CO₂ storage in the EEZ to Government approval. It is, however, questionable whether CO₂ storage really constitutes dumping 'onto the continental shelf' according to the definition in UNCLOS, Article 210.

⁵⁶ A 'geological formation' is defined as 'a lithostratigraphical subdivision within which distinct rock layers can be found and mapped'. Directive 2009/31/EC, Article 3 (4).

⁵⁷ Directive 2009/31/EC, Article 4.

⁵⁸ A 'significant risk' is 'a combination of a probability of occurrence of damage and a magnitude of damage that cannot be disregarded without calling into question the purpose of [the] Directive for the storage site concerned' (Directive 2009/31/EC, Article 3 (18)). The purpose of the Directive is not set out explicitly. However, it 'establishes a legal framework for the environmentally safe geological storage of carbon dioxide (CO₂) to contribute to the fight against climate change.' (Directive 2009/31/EC, Article 1 (1)). The purpose of 'environmentally safe geological storage of CO₂' is defined as 'permanent containment of CO₂ in such a way as to prevent and, where this is not possible, eliminate as far as possible negative effects and any risk to the environment and human health.' (Directive 2009/31/EC, Article 1 (2)). Hence, the purpose of the Directive may be assumed to be at least that. Accordingly, a 'significant risk' should be at least a combination of a probability of occurrence of damage and a magnitude of damage that cannot be disregarded without calling into question the ability of permanent containment of CO₂ (at a specific site) to prevent and, where this is not possible, eliminate as far as possible negative effects and any risk to the environment and human health. Reasonably, it is a tall order to establish e.g. when a risk calls into question the ability to eliminate as far as possible negative effects and any risk which may not be prevented. Not least since the definition appears to be based on circular reasoning.

⁵⁹ Directive 2009/31/EC, Article 4 (3) and Annex I.

requirement of 'no significant risk' will be construed remains to be seen. Since CCS, like most large-scale industrial operations, is inevitably associated with certain risks, it comes down to how 'significant' is to be understood. Also crucial will be for the responsible authorities to settle on a sufficient but not excessive amount of data to require from the operator. With complex systems there always tend to be further measurements or assessments that could be made, but the value of the data produced will have to be weighed against costs and time required. This, of course, is nothing unique for CO₂ storage, but the novelty of the activity may make it particularly hard to identify what constitutes an appropriate amount of data for basing important decisions on.

The operation of a geological storage site normally requires a permit from a competent national authority.⁶⁰ To qualify for a permit, the prospective operator must inter alia be technically competent and must provide a financial security. The financial security is further discussed below.⁶¹

If a permit is granted, it should define, inter alia, the total quantity of CO₂ that may be stored, limits for reservoir pressure, and the maximum injection rates and pressures. It must also contain an approved monitoring plan, an approved corrective measures plan, conditions for closure, and an approved provisional post-closure plan.⁶²

The CO₂ stream to be injected must consist overwhelmingly of CO₂. Concentrations of all incidental substances from the source, capture or injection process as well as of any trace substances that may have been added to assist in monitoring must meet certain requirements. They may not adversely affect the integrity of the storage site or the relevant transport infrastructure or pose a significant risk to the environment or human health. They must also not breach the requirements of applicable EU legislation, such as the Directive on Emissions from Large Combustion Plants⁶³ or the Industrial Emissions Directive.⁶⁴ Only streams that have been analysed as to their composition, and for which a risk assessment has been carried out, may be injected.⁶⁵

The operator of the storage site must monitor the injection facilities, the storage complex (including where possible the CO₂ plume), and where appropriate the surrounding environment. The monitoring, which is to be carried out in accordance with the monitoring plan, has several purposes. These include comparison between the actual and modelled behaviour of CO₂ and formation water; detection of significant irregularities; detection of CO₂ migration or leakage; detection of significant adverse effects for the surrounding environment; and updating of the assessment of the safety and integrity of the storage complex in the short and long term.⁶⁶ Since monitoring requirements should in principle be risk-based they will depend on the risk assessment for each storage complex.⁶⁷ This makes it hard to draw general conclusions regarding the extent and nature of the monitoring required. In addition to the CCS Directive, the monitoring activities must also meet the requirements of the ETS and its

⁶⁰ Directive 2009/31/EC, Articles 6 (1) and 2 (2).

⁶¹ See section 7.

⁶² Directive 2009/31/EC, Article 9.

⁶³ Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants, OJ L 309, 27.11.2001, p. 1.

⁶⁴ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Text with EEA relevance), OJ L 334, 17.12.2010, p. 17. This directive is to be implemented in national legal orders by 2014.

⁶⁵ Directive 2009/31/EC, Article 12 (3).

⁶⁶ Directive 2009/31/EC, Article 13 (1).

⁶⁷ Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: Characterisation of the Storage Complex, CO₂ Stream Composition, Monitoring and Corrective Measures, Guidance Document 2, European Communities, 2011, p. 91.

monitoring and reporting guidelines (MRG).⁶⁸ These are discussed below. The nonbinding EU guidelines on monitoring emphasize that the choice of monitoring technology should be based on the best available practice at the time monitoring plans are formulated or updated, and that the cost effectiveness of specific technologies may be considered in that context.⁶⁹

In case of leakage or any irregularity, which implies the risk of a leakage or risk to the environment or human health, the operator must immediately notify the competent authority, and take any necessary measures to correct significant irregularities or to close leakages.⁷⁰

‘Leakage’ does not only occur if CO₂ gets out into the atmosphere, the ocean or groundwater. Any release of CO₂ from the storage complex (i.e. the storage site itself and any secondary containment formations) identified is considered leakage.⁷¹ How the storage complex is defined in the permit may thus have very significant consequences. However, under the EU ETS the practical definition of leakage is slightly narrower. This is further discussed in section 7.1. below. Once the storage site has been closed – something which normally requires that all the relevant conditions stated in the permit have been met – the operator is responsible for sealing the storage site and removing the injection facilities. The operator also remains responsible for monitoring, reporting and dealing with irregularities or leakage, and for obligations under the EU ETS. If the closure has occurred because the competent authority has withdrawn the storage permit – which it may do, inter alia, if the operator has failed to meet the permit conditions – the mentioned responsibilities will instead rest with the authority. The costs, however, are to be recovered from the operator, including by drawing on the financial security.⁷²

In the normal case when closure has occurred on the operator’s initiative, all legal obligations for the site should eventually be transferred from the operator to the State. Such transfer of responsibility requires, inter alia, that the site has been sealed, the injection facilities removed, and that all available evidence indicates that the stored CO₂ will be completely and permanently contained. With regard to the last requirement, the operator must at least demonstrate the conformity of the actual behaviour of the injected CO₂ with the modelled behaviour; the absence of any detectable leakage;⁷³ and that the storage site is evolving towards a situation of long-term stability.⁷⁴

Transfer should normally not occur until 20 years have elapsed from the closure of the site. It may be earlier, however, if the responsible authority is already confident that all available evidence indicates that the stored CO₂ will be completely and permanently contained. Also after the transfer of responsibility the authority shall recover from the former operator any costs incurred if there has been fault on the part of the operator, including deficient data, concealment of relevant information, or negligence.⁷⁵

⁶⁸ 2007/589/EC: Commission Decision of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, OJ L 229, 31.8.2007, p. 1.

⁶⁹ Guidance Document 2, note 67 above, p. 92.

⁷⁰ Directive 2009/31/EC, Article 16 (1) and Article 3 points 17 and 19.

⁷¹ Directive 2009/31/EC, Article 3 points 5-6.

⁷² Directive 2009/31/EC, Article 17.

⁷³ According to the nonbinding guidelines on transfer of responsibility such absence of leakage may be deemed to exist if the operator demonstrates that there are no leakages for a continuous period of 10 years before the time of transfer. Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: Criteria for Transfer of Responsibility to the Competent Authority, Guidance Document 3, European Communities, 2011, p. 8

⁷⁴ What may indicate such evolution has been further elaborated in the nonbinding guidelines. See *ibid.*, p. 9.

⁷⁵ Directive 2009/31/EC, Article 18 (1) and (7).

Before transfer of responsibility the operator must make a 'financial contribution' available to the competent authority. This is to cover at least the anticipated cost of monitoring the site for a period of 30 years after the transfer.⁷⁶ This is further discussed below in the section 6.

After the transfer of responsibility, monitoring may be reduced to a level which allows for detection of leakages or significant irregularities. If any leakages or significant irregularities are detected, monitoring shall be intensified as required.⁷⁷ This will, in the particular case with a storage site on the Norwegian continental shelf, be the responsibility of the Norwegian State.

3.2. Permit procedures

Under EU law, a storage site may not operate without a permit issued by the Member State under whose jurisdiction the storage is to be located.⁷⁸ This requires a permit procedure to be established in each State that accepts, in principle, the establishment of CO₂ storage sites within its territory. It should reasonably apply also to storage under a Member State's jurisdiction at sea. As noted above intended storage of less than 100 kilotonnes, undertaken for research, development or testing of new products and processes is not covered by the CCS Directive, why Member States are free to decide whether or not to require permits for such sites.⁷⁹

If, before a permit for storage is applied for, there is a need to assess potential storage complexes by means of activities intruding into the subsurface, such as drilling and injection tests, that requires a specific exploration permit.⁸⁰ In case of competing applications for a storage permit for the same site, an exploration permit for the site in question shall normally give the holder priority, provided that the application is made while the exploration permit is still valid.⁸¹

Before a permit application can be submitted an EIA must be carried out in accordance with the EIA Directive and any additional national requirements.⁸² Permits are to be granted on the basis of objective, published and transparent criteria.⁸³ An application for a storage permit must, inter alia, contain proof of the technical competence of the potential operator; a characterisation of the storage site and storage complex and an assessment of the expected security of the storage; a proposed monitoring plan; and a proposed plan for measures to correct significant irregularities or to close leakages in order to prevent or stop the release of CO₂ from the storage complex (a so called corrective measures plan).⁸⁴

The required characterization and assessment of the potential storage complex and surrounding area are to be carried out in three steps: Step 1 being data collection; Step 2 the building of a three-dimensional static geological earth model; and Step 3 characterisation of the storage dynamic behaviour, sensitivity characterisation, and risk assessment. Each step is further described in the CCS Directive's Annex I.⁸⁵

The static geological earth model (or models) must characterise the complex in terms of, inter alia, geological structure of the physical trap; geomechanical, geochemical and flow properties of the

⁷⁶ Directive 2009/31/EC, Article 20.

⁷⁷ Directive 2009/31/EC, Article 18 (6).

⁷⁸ Directive 2009/31/EC, Article 6 (1).

⁷⁹ Directive 2009/31/EC, Article 2 (2).

⁸⁰ Directive 2009/31/EC, Article 5.

⁸¹ Directive 2009/31/EC, Article 6 (3).

⁸² Directive 85/337, Article 4.1 and Annex I, point 23 (as amended by Directive 2009/31/EC).

⁸³ Directive 2009/31/EC, Article 6 (2).

⁸⁴ Directive 2009/31/EC, Article 7.

⁸⁵ Directive 2009/31/EC, Article 7 (3), 4 (3) and Annex I.

reservoir overburden (caprock, seals, porous and permeable horizons) and surrounding formations; fracture system characterisation and presence of human-made pathways, including wells and boreholes; and pore space volume.⁸⁶

Storage permits are to be reviewed five years after issuing and every 10 years thereafter.⁸⁷

In Norway, under whose jurisdiction the identified likely storage site is located, the permit procedure for sub seabed storage is likely to be based on the Oil Law (Petroleumsloven)⁸⁸ and the Pollution Control Act (Forurensningsloven)⁸⁹.

Considering the relative novelty of technology and the absence of well-established permit procedures it is very hard to indicate a timeframe for exploration activities, environmental impact assessment, and permit procedure required for the establishment of a storage site. The applicable EU guidelines indicate a frame of between two and 11 years from the award of an exploration permit (presuming that such is needed) to the award of a storage permit. For saline reservoirs, an exploration program is also likely to be required. The bottom end of this frame could only apply with respect to storage in existing oil and gas fields with no need for exploration and provided that a smooth approval system is already in operation. Preparing an application for the required exploration permit could require an additional one to two years.⁹⁰ This timeline is generally supported also by the CO₂ Capture Project.⁹¹ However, they are overly optimistic when claiming that the actual permit procedure will only require six-eight months. Consultations with neighbouring countries are likely to be required,⁹² and the EU-commission may use four months for reviewing the draft storage permit before issuing a non-binding opinion on it. If the permit decision is then appealed, the process is more likely to take one and a half to three years.

Considering the Norwegian government's general attitude towards CCS it must be assumed that the government would be generally supportive of the establishment of storage sites. The legal framework can nonetheless suffer from teething problems (e.g. in the form of inconsistencies or lack of clarity) which can initially make the process more cumbersome and time-consuming than expected.

4. Regulation of CO₂ transport

Transport of CO₂ by ship and/or by pipeline is in itself not a novelty. More significant is perhaps that it also features strong similarities with familiar transport systems for natural gas. From a legal perspective analogies with the regulation of natural gas can therefore be informative. However, the general lack of pre-existing CO₂ -structures does entail some specific challenges. The need for an integrated transport system means that the commencement of operation may require all parts of the transport and storage infrastructure to be in place. The most time-consuming procedure could thus determine the start of operation for the system as a whole. This may be problematic if, as will be

⁸⁶ Annex I, Step 2.

⁸⁷ Directive 2009/31/EC, Article 11 (2).

⁸⁸ LOV 1996-11-29 nr 72: Lov om petroleumsvirksomhet.

⁸⁹ LOV-1981-03-13-6: Lov om vern mot forurensninger og om avfall.

⁹⁰ Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: CO₂ Storage Life Cycle Risk Management Framework, Guidance Document 1, European Communities, 2011, p. 17.

⁹¹ I. Chrysostomidis and E. Stamatiou, Update on Selected Regulatory Issues for CO₂ Capture and Geological Storage, CO₂ Capture Project, Final Report, November 2010, p. 28.

⁹² This may inter alia be required by the EIA Directive (Council Directive 85/337/EEC), Article 7, and by the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention). Regarding the convention, see further Langlet 2009, note 14 above, at 291, and .R. Purdy, 'Geological Carbon Dioxide Storage and the Law', in S. Shackley and C. Gough (eds), Carbon Capture and its Storage: An Integrated Assessment (Ashgate, 2006), p. 125.

discussed below, the time for obtaining permits varies considerably between the States concerned. The problem may be partly remedied if the transport system allows for commencement of some transport and injection operations even before all major CO₂ sources are connected to the system.

4.1. Substantive requirements

Although the Swedish version of the pertinent regulation seems to stipulate otherwise, shipments of CO₂ are not covered by the EU-regulation on shipments of waste as long as they are carried out for the purposes of geological storage in accordance with the CCS Directive. This is clear e.g. from the English and Danish versions of the Regulation, and also follows from a purposive interpretation.⁹³ Such shipments are also not covered by the so-called Seveso II Directive on the control of major-accident hazards involving dangerous substances.⁹⁴

Safety issues pertaining to CO₂ transport by ship are covered by international agreements and some EU rules.⁹⁵ Ship transport of CO₂ is not a novel activity in the region, although it has so far been conducted at a small scale.⁹⁶

Protected areas, particularly those designated as Natura 2000 areas according to the EU's habitat directive,⁹⁷ may significantly affect the laying of pipelines from some major CO₂ point sources in the region. This could pose a problem e.g. in relation to Nord-Jyllandsverket in Aalborg, Preem in Lysekil, and Borealis in Stenungsund.

Any project likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, must be assessed as to its implications for the site in view of the site's conservation objectives. The project may only be allowed if it will not adversely affect the integrity of the site, or, if it will have negative implications for the site, only if there are imperative reasons of overriding public interest for allowing it and no alternative solutions exist. In the latter case all compensatory measures necessary must also be taken to protect the overall coherence of Natura 2000.⁹⁸ Hence, projects in, or in the vicinity of, Natura 2000 sites are likely to face very significant obstacles if they are deemed to have a significant impact on (certain aspects of) the natural environment. However, a detailed study of each location is required before any final conclusions as to the obstacles this may pose to the laying of CO₂ pipelines from a particular source may be drawn. The maps provided here, showing Natura 2000 areas in the vicinity of the most affected point sources, may be indicative of the situation, but should not be used for drawing any conclusions regarding the feasibility of connecting the sources in question to a CO₂ pipeline system.

⁹³ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste, OJ L 190, 12.7.2006, p. 1, (as amended through directive 2009/31/EC), Article 1 (3) (h). Regarding the Swedish version of the regulation, which seems to exempt CO₂ streams from the waste definition only when they have been transported to the storage site, see Langlet 2009, note 45 above, p. 85.

⁹⁴ Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances, OJ L 10, 14.1.1997, p. 13.

⁹⁵ See further A. Raine, 'Transboundary Transportation of CO₂ Associated with Carbon Capture and Storage Projects: An Analysis of Issues under International Law', *Carbon & Climate Law Review*, no 4, 2008, p. 358.

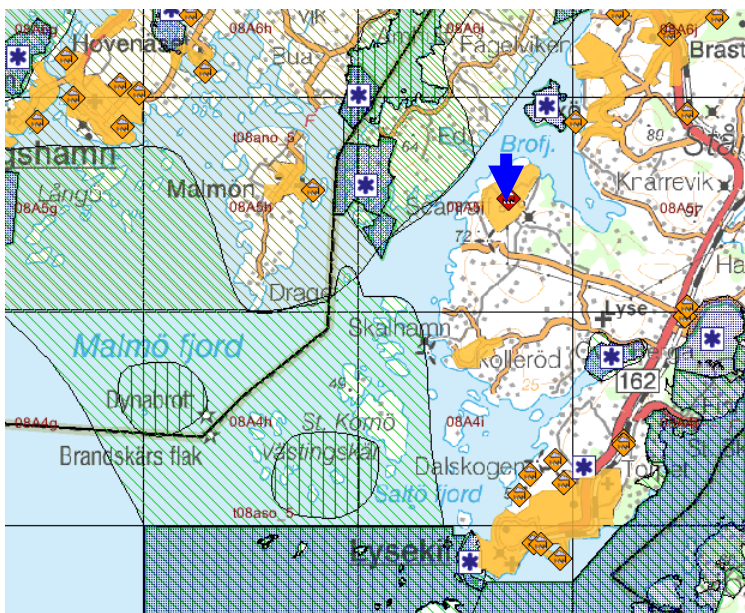
⁹⁶ Fullskala CO₂-håndtering, Meld. St. 9, (2010–2011), p. 30.

⁹⁷ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206, 22.7.1992, p. 7.

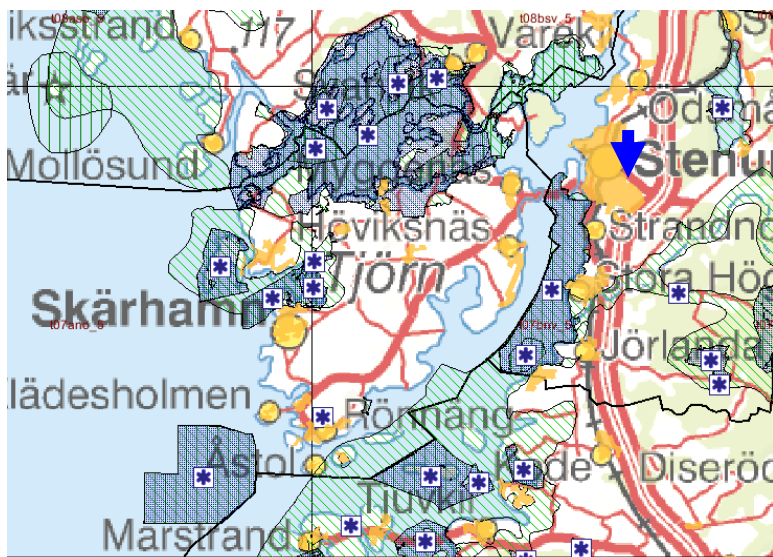
⁹⁸ Directive 92/43/EEC, Article 6.



Nord-Jyllandsverket in Aalborg . The green and violet areas are designated as Natura 2000 areas. © Kort & Matrikelstyrelsen



Preem in Lysekil. The areas covered with green diagonal lines (sometimes covered by a blue shade) are designated as Natura 2000 areas. © Lantmäteriet.



Borealis in Stenungsund. The areas covered with green diagonal lines (sometimes covered by a blue shade) are designated as Natura 2000 areas. © Lantmäteriet.

4.2. Permit procedures

The laying of pipelines will generally be subject to a permit requirement.⁹⁹ Under EU law an EIA will be compulsory for pipelines with a diameter of more than 800 mm and a length of more than 40 km if intended for CO₂ transport for the purposes of geological storage. Associated booster stations are to be included in the assessment.¹⁰⁰ Regarding smaller pipelines for the same purpose, the Member States must themselves determine through a case-by-case examination or thresholds or criteria set by the individual State, whether to require an EIA.¹⁰¹ In Denmark, the applicable regulation follows the EU legislation by requiring an EIA for sea-based CO₂ pipelines above the same 800 mm/40 km threshold. Smaller and/or shorter pipelines will be subject to an EIA requirement if they are likely to have significant effects on the environment according to criteria set out in the regulation.¹⁰² Under Swedish law all CO₂ pipelines will require an EIA according to a proposed amendment.¹⁰³

The time needed for the permit procedure is hard to predict in general terms. Whereas specific time limits apply to the assessment in Denmark that is not the case in Sweden. The North Stream pipeline in the Baltic Sea provides an illustrative example. In Denmark the permit procedure – the EIA not included – took just over one year¹⁰⁴ In Sweden the same procedure took 23 months. A previous assessment of a permit application concerning a gas pipeline between Germany and Sweden required 34 months.

A worst-case scenario from the applicant's perspective would be that a permit is denied after such a lengthy assessment. In the Swedish case that could be appealed to the Supreme Administrative Court which would then examine if the government had applied the law correctly. An If a permit was granted an appeal could also be launched by an affected individual or a non-governmental

⁹⁹ That follows e.g. from the amended Danish Undgrundsloven, § 23 u, and the proposed amendment to the Swedish lag om visa rörledninggar.

¹⁰⁰ Directive 85/337/EEC, Annex I, point 16 (as amended through Directive 2009/31/EC) and Article 4(1).

¹⁰¹ Directive 85/337/EEC, Annex II, point 10 (i) (as amended through directive 2009/31/EC) and Article 4(2).

¹⁰² Bekendtgørelse om VVM, konsekvensvurdering vedrørende internationale naturbeskyttelsesområder samt beskyttelse af visse arter ved projekter om kulbrinteindvinding, rørledninger, m.v. på søterritoriet og kontinentalsoklen, BEK nr 359 af 25/03/2010, Articles 1 and 4.

¹⁰³ Promemoria, note 33 above, pp. 79 and 96.

¹⁰⁴ Seven months in Energistyrelsen and after appeal six months in Energiklagevernet.

organization promoting environmental protection.¹⁰⁵ This would add up to one year. It is not that unlikely that the court in such a case would deem it necessary to ask for a preliminary ruling from the EU court in order to have some particular aspect of applicable EU law authoritatively interpreted.¹⁰⁶ That could add another one and a half year to the process.¹⁰⁷

Set time frames are also common in Norway, why Sweden is likely to be the weakest link in the system in terms of the time needed to obtain a permit (or a final denial of the permit application). Norway also has extensive experience with sea-based gas pipelines which should make an application for one or several CO₂ pipelines less exceptional and less likely to meet significant opposition.

If the EIA procedure, including consultations with affected stakeholders and the general public is included, a further one and a half to three years need to be added to the general timeline. This gives a preliminary time frame for the permit procedure, including EIA, for a sea-based CO₂ pipeline of between three and a half and eight years.

5. Third party access to CCS infrastructure

Pipelines connecting to a CO₂ storage site have been deemed to be so called natural monopolies.¹⁰⁸ It is thus no surprise that the CCS Directive contains rules on access to transport networks and storage sites. However, these rules are not very precise and leave States considerable discretion when implementing and elaborating the requirements in national law.¹⁰⁹

Potential users must be able to obtain access to transport networks and to storage sites for the purposes of geological storage of captured CO₂. Access shall be provided in a transparent and non-discriminatory manner determined by each Member State. The directive lists certain criteria that shall be taken into account – including storage and transport capacity that can reasonably be made available – but these create little predictability as to how the rules will play out in practice.¹¹⁰ It is clear that transport network operators and operators of storage sites may refuse access on the grounds of lack of capacity. However, Member States must ensure that an operator refusing access on such grounds or a lack of connection makes necessary enhancements as far as it is economic to do so, or when a potential customer is willing to pay for them, provided that it would not negatively impact on the environmental security of transport and storage.¹¹¹ An operator can thus not fully control the design and capacity of the installations over time, if that would result in suboptimal or discriminatory use of transport or storage resources. It is unclear whether these rules, once elaborated and applied in Denmark, Norway and Sweden will be sufficiently clear and conducive to the promotion of investor confidence in early CCS infrastructure. It is also unclear to what extent such rules will harmonize between the countries. Little or no attention has so far been given to the issue of third-party access to CCS infrastructure in the national implementation processes in the countries concerned. The Swedish proposal stays very

¹⁰⁵ Lag (2006:304) om rättsprövning av vissa regeringsbeslut, Article 2.

¹⁰⁶ Under Article 267 of the Treaty on the Functioning of the EU.

¹⁰⁷ Court of Justice of the European Union, PRESS RELEASE No 13/11, Luxembourg, 2 March 2011.

¹⁰⁸ M.M. Roggenkamp, 'The concept of third-party access applied to CCS', in M. M. Roggenkamp and E. Woerdman (eds) *Legal Design of Carbon Capture and Storage*, Intersentia, 2009, pp. 273-299, at p. 279.

¹⁰⁹ Eilertsen 2010, note 38 above, p. 139.

¹¹⁰ Article 21 (2).

¹¹¹ Article 21 (3-4).

close to the Directive.¹¹² The same is so true for the applicable Danish law, although it authorizes the Minister for climate and energy to issue further rules on the subject.¹¹³

A way to practically handle the uncertainties relating to access to infrastructure could, at least initially, be for interested CO₂ producers to set up joint entities to act as operators of transport infrastructure and storage sites. However, such a scheme may encounter several problems, not least the need for CO₂ producers to agree to long-time commitments early in the CCS deployment process. These producers are also, with few exceptions, unlikely to have much expertise in fields pertinent to CO₂ storage. Another option could be for governments to play a significant role in the actual construction and operation of CCS infrastructure in order to guarantee availability of capacity. Public-private partnerships could be a model for spreading risks and engaging concerned industries while giving governments a say – apart from their purely regulatory role – in the management of the infrastructure.

The EU commission initially considered a more elaborate regulatory approach to third-party access imposing specific rules similar to those existing for gas and electricity. Since the market for CCS is at an early stage and indications were that there will in practice be separate operators for the combustion and capture phase, on the one hand, and transport and storage on the other, a substantial approach was not deemed proportionate at this stage.¹¹⁴ It is likely that further harmonization at the EU level will eventually be deemed necessary if different national rules turn out to distort competition and/or hamper CCS-structures that involve several jurisdictions.¹¹⁵

6. Financial security

The CCS Directive requires the operator of a storage site to establish a financial security – to be valid and effective before commencement of injection – in order to ensure that all obligations arising under the storage permit can be met. That includes closure and post-closure requirements and any obligations arising under the EU ETS.¹¹⁶ In particular this means that the financial security must be able to cover the purchase of emission allowances for any future leak. This necessitates estimations of highly uncertain future costs. According to nonbinding EU commission guidelines the cost for such a leak may be based on either a conservative estimate of the maximum portion of CO₂ that can be released from storage, which, in most situations, will be much less than 100%; or a calculation of the potential leakage amount based on a probability distribution of the amount of leakage from the storage complex.¹¹⁷

It is hardly possible to say what level of financial security this will require until a significant amount of information regarding a particular storage site has been collected and a dialogue has been initiated with the competent national authorities.

The financial security is to be periodically adjusted to take account of changes to the assessed risk of leakage and the estimated costs.

¹¹² Promemoria, note 33 above, p. 78.

¹¹³ Undergrundsloven, § 23 t.

¹¹⁴ Accompanying Document, 23.1.2008, SEC(2008) 54, Section 6.4.

¹¹⁵ Roggenkamp 2009, note 108 above, p. 299.

¹¹⁶ Directive 2009/31/EC, Article 19.

¹¹⁷ Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 4, European Communities, 2011, p. 17.

No clarification has so far been provided as to how these requirements will be applied in the countries concerned. The applicable Danish law largely restates the Directive's requirements. It does, however, provide for more detailed rules to be adopted by the Minister on climate and energy.¹¹⁸

The operator of a storage site will also be obliged to make a 'financial contribution' available to the competent authority before transfer of responsibility takes place. That is to cover at least the anticipated cost of monitoring the site for a period of 30 years after transfer of responsibility.¹¹⁹

Although the financial contribution need not be made available until the end of the post-closure period, the EU Commission points out that since the operator's injection-related revenues will then have ceased the contribution will have to be secured at an early stage of the storage project. In effect the financial security required during the operation of the site will also cover the financial contribution for the post-transfer phase.¹²⁰ The CCS Directive leaves to the individual States to decide whether they want the financial contribution to cover more than the anticipated cost for of 30 years of monitoring up to the full estimated amount of the costs which the competent national authority will incur for all post-transfer obligations.¹²¹ In Danish law the contribution has been fixed to the anticipated cost of monitoring the site for a period of 30 years.¹²² Whether that will also apply in Norway or Sweden is not yet clear.

7. Liability under EU Emissions Trading Scheme

As mentioned several times above, there are many types of liability regarding CCS operations. Liability in this context refers only to the assigning of responsibilities for monitoring and reporting of CO₂ emissions across the CCS chain. In this section, a general outline of the EU Emissions Trading Scheme (EU ETS) is given and its implications for CCS operations are discussed.

Under the scheme, certain activities need a permit to emit greenhouse gases. Directive 2003/87/EC from 2003 (the Trading Directive), Annex I details the types of activities. Each tonne greenhouse gas (CO₂ equivalents) emitted from such an installation must be covered by an emission quota, an EU Allowance (EUA). Each installation must also monitor and report its emissions. Allowances are then allocated to the installations for free or by auction, or simply by letting the operators buy allowances on the open market. Thus, the legal emissions from the collective of activities covered are restricted to the amount of EUA:s issued. The Directive regulates how the EUA is created, distributed, transmitted, and finally cancelled, it also stipulates the penalties to be imposed on activities not surrendering a sufficient amount of EUA:s.¹²³

By implementing the Directive, each Member State has created a national trading system. These 27 national systems have been linked to each other through two mechanisms provided for in the Directive: Member States shall ensure that the emissions allowances can be transferred between

¹¹⁸ Undergrundsloven, LBK nr 889 af 04/07/2007, § 23 q.

¹¹⁹ Directive 2009/31/EC, Article 20.

¹²⁰ Guidance Document 4, note 117 above, p. 41.

¹²¹ Guidance Document 4, note 117 above, p. 43.

¹²² Undergrundsloven, § 23 r.

¹²³ For an extensive analysis of the EU Emissions Trading Scheme, see e.g. Olsen Lundh, Christina; *Att ransonera utsläppsutrymme. En miljörättslig studie om utsläppshandel enligt Kyotoprotokollet och EU ETS* (Iustus förlag, Juridiska institutionens skriftserie, 2010).

persons within the entire EU and allowances issued by the competent authority in one Member State shall be recognized by other Member States.¹²⁴

The Trading Directive has been amended several times.¹²⁵ The last amendment regulates the post 2012 phase where some additional gases (initially only CO₂ was covered) and some new types of activities will be included. An important prerequisite of enlargement is that emissions must be possible to monitor, report and verify with at least the same amount of reliability that currently applies.¹²⁶ Among the activities that will be included from 2013 is CCS.

If the emissions from an installation are captured, transported and stored in accordance with the CCS Directive¹²⁷, the installation may be released from the obligation to cover emissions with allowances.¹²⁸ Since captured CO₂ never reaches the atmosphere (or is not supposed to), the obligation never arises. Not having to buy EUA:s (or being able to sell) is supposed to be the main long-term incentive for CCS and new renewable energy technologies.¹²⁹ Those installations will not have to buy as many EUA:s as otherwise or might be able to sell a surplus. To create this incentive, no free allocation will be given to capture installations, pipelines or storage sites.¹³⁰

The Trading Directive requires monitoring and reporting.¹³¹ Letting EU ETS cover CCS is also a way to handle the responsibility for accidental discharges. The purpose of including CCS in the EU ETS is thus twofold. It creates *incentives* for storage but is also a way to handle the *responsibility* for accidental discharges.¹³² Responsibility for climate damage caused by leakage is put on the capture-installation, the pipeline transport and the storage sites by including them in the EU ETS and thus obliging them to cover CO₂ emissions with allowances. This obligation covers emissions that originate from leakage (including fugitive emissions and vented emissions) whether during capture, transport or storage.¹³³ In order for an installation to be released from the obligation to cover emissions with allowances, the Trading Directive requires monitoring and reporting all along the chain. Would, for

¹²⁴ Directive 2003/87/EC, Article 12. Under certain conditions the allowances shall also be possible to trade between persons in the EU and persons in third countries (Article 25).

- Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms,
- Directive 2008/101/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (19 November 2008) and
- Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC Directive 2009/29/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

When referring to the Directive 2003/87/EC, reference will be made to the Consolidated version of Directive 2003/87/EC, if not stated otherwise.

¹²⁶ Directive 2009/29/EC preambular para 10.

¹²⁷ Directive 2009/31/EC.

¹²⁸ Directive 2003/87/EC, Article 12.

¹²⁹ Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community, preambular para 20.

¹³⁰ Directive 2003/87/EC, Article 10a point 3 and Directive 2009/29/EC preambular para 19. However; to accelerate the demonstration of the first commercial facilities and of innovative renewable energy technologies, allowances should, according to the amendment-directive, be set aside from the new entrants reserve to provide the first such facilities in the Union a guaranteed reward for tonnes of carbon dioxide stored or avoided on a sufficient scale, provided an agreement on knowledge-sharing is in place. This additional financing should, according to the amendment-directive, apply to projects of sufficient scale, which are innovative in nature and which are significantly co-financed by the operator covering, in principle, more than half of the relevant investment cost, and taking into account the viability of the project. (Directive 2003/87/EC Article 10a points 7 and 8, plus Directive 2009/29/EC preambular para 20).

¹³¹ Directive 2003/87/EC, Article 14.

¹³² COM(2008) 18 final, para. 5.

¹³³ Directive 2009/31/EC preambular para 30.

some reason, the CO₂ escape, allowances must be surrendered. This is why it is possible to release installations from their obligation; if the captured CO₂ escapes somewhere else along the chain, it will still be covered for.¹³⁴

It is important that the captured CO₂ is classified in the same way within the EU ETS and the United Nations Framework Convention on Climate Change/Kyoto Protocol (UNFCCC/KP) since the registers within the EU ETS are connected to the so called International transaction log. According to the *IPCC Special Report on CO₂ Capture and Storage* the two main options for including CCS in national greenhouse gas inventories are *source reduction* (an option to reduce emissions to the atmosphere) and *sink enhancement* (in analogy with the treatment of CO₂ removal by sinks in the sector Land Use, Land-Use Change and Forestry (LULUCF)).

Reduced emissions are reported in the category where capture takes place. If capture takes place in power plants it will be reported using lower emission factors than for plants without CCS. This could reduce transparency of reporting and make a review of the overall impact on emissions more difficult, especially where transportation and storage includes captured CO₂ from many sources, or when these take place across national borders.¹³⁵ However, the sink enhancement option is not very appropriate: CCS systems do not meet the definition for a sink, since the CO₂ captured has never reached the atmosphere.¹³⁶ The UNFCCC defines a sink as any process, activity or mechanism which removes a greenhouse gas *from the atmosphere*.

Consequently, for the purposes of the UNFCCC/KP, stored CO₂ will most likely be classified as an emission reduction¹³⁷ which also seems to be the approach chosen within EU ETS: The obligation to surrender allowances does not arise if the CO₂ doesn't reach the atmosphere.¹³⁸ The risk mentioned above, once again, emphasizes the need for a fully monitored and transparent chain where any leakage must be 'payed for' (in EUA:s) under the system.

7.1. CCS activities covered by the Trading Directive

The Trading Directive details the types of activities covered by EU ETS in Annex I. Being covered has, as mentioned above, three main implications where very central words are 'permit', 'monitor' and 'report'.

The obligation to monitor emissions follows not only from the permit but also directly from the Trading Directive. The principles are set out in Annex IV, which states that it shall be done either by calculation or on the basis of measurement. If emissions are calculated, information must be given on factors used. If they are measured, information must be given on the reliability of measurement methods. Much emphasis is put on calculation: If measurement is chosen, supporting calculations must corroborate the measurements. In the reports, information must be given on total emissions as well as on uncertainty.

The reports submitted by operators must be verified as satisfactory. A certain methodology for the verification process is prescribed in the Trading Directive, Annex V, including consideration of the

¹³⁴ At Community level there are also other legal instruments to handle some of the environmental risks of CCS (see note 122 above).

¹³⁵ IPCC, *IPCC Special Report on Carbon Dioxide Capture and Storage*, prepared by Working Group III of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2005), p. 367.

¹³⁶ IPCC, *IPCC Special Report on Carbon Dioxide Capture and Storage*, prepared by Working Group III of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2005), p. 367.

¹³⁷ For the same conclusion, see e.g. R. Purdy and R. Macrory, *Geological Carbon Sequestration: Critical Legal Issues*, (Tyndall Working Paper, 2004)..

¹³⁸ Directive 2003/87/EC, Article 12 and Directive 2009/29/EC preambular para 20.

report and of the monitoring during the preceding year. The verification addresses the reliability, credibility and accuracy of monitoring systems and the reported data and information relating to emissions. The verifier must be independent of the operator, carry out his activities in a sound and objective professional manner and be given access to all sites and information in relation to the subject of the verification. Reported emissions may only be validated if reliable and credible data and information allow the emissions to be determined with a high degree of certainty. An operator whose report has not been verified as satisfactory for emissions during the preceding year is not allowed to make further transfers of allowances until such a report is verified as satisfactory.¹³⁹

The Trading Directive prescribes that the Commission shall adopt guidelines for the monitoring and reporting of emissions.¹⁴⁰ The Directive also requires the Member States to ensure that operators report their emissions in accordance with these guidelines.¹⁴¹ Thus, through the Directive, those guidelines become legally binding. Such guidelines were adopted in the Monitoring and Reporting Guidelines, MRG:s, in 2007.¹⁴² MRG Annex II applies to all activities covered by the Trading Directive and gives an overall approach formula for determining the total emissions of greenhouse gases from an emission source. The following annexes provide further activity-specific guidelines. In June 2010, the Commission released an amendment applicable on the different phases of CCS.

The Trading Directive covers capture of greenhouse gases from installations covered by that Directive for the purpose of transport and geological storage in a storage site permitted under the CCS Directive. Thus; to be covered by the Directive the capture needs to take place at an installation that, in itself, is covered by the Trading Directive.¹⁴³ The capture must also be made for the purpose of transport and geological storage in a storage site permitted under the CCS Directive.¹⁴⁴ Guidance for the determination of emissions from capture is found in MRG Annex XVI.

Potential emission sources in the capture operation, identified in Annex XVI, are CO₂ transferred to the capture installation (INPUT) and emissions from all other activities at the installation (potential emissions without capture). If there is no transferred CO₂ the input equals zero. Potential emissions are added and then the CO₂ transferred to a transport network for storage ($T_{\text{for storage}}$) is subtracted. If then, there is a net emission, allowances must be paid. For each measurement point a total uncertainty of the overall emissions of less than $\pm 2.5\%$ shall be achieved as a minimum accuracy requirement to the calculation.¹⁴⁵

The next CCS phase covered by the Trading Directive is transport of greenhouse gases by pipeline.¹⁴⁶ The guidelines for monitoring are found in the MRG, Annex XVII, which permits two approaches to report the potential emissions. The operator must demonstrate that the chosen method (A or B) provides the most reliable results and the least uncertainty. *Method A*, is based on a mass-balance (input-output) calculation. The CO₂ entering the pipeline at its 'entry point' (INPUT) is added to the emissions from the transport networks' own activities, ($E_{\text{ownactivity}}$). This is emissions not stemming from the CO₂ transported, but from for example fuel use from booster stations. Then the CO₂ transferred from the transport network at its 'exit point' (OUTPUT) is subtracted. The net emissions must be covered by EUA:s. *Method B* involves calculating the CO₂ emissions of the network and is

¹³⁹ Directive 2003/87/EC, Article 15.

¹⁴⁰ Directive 2003/87/EC, Article 14.

¹⁴¹ Directive 2003/87/EC, Article 14.

¹⁴² Decision 2007/589/EC.

¹⁴³ Directive 2003/87/EC, Annex I.

¹⁴⁴ Directive 2003/87/EC, Annex I.

¹⁴⁵ MRG Annex XII, Tier 4.

¹⁴⁶ Directive 2003/87/EC, Annex I.

based on potential sources of emissions. Vented CO₂ and emissions from leakage events (to be determined by industry best practice), are added to emissions from combustion or other activities functionally connected to the pipeline transport in the transport network (e.g. booster stations) and fugitive emissions from the transport network.¹⁴⁷

Covered by the EU ETS is also geological storage of greenhouse gases in a storage site permitted under the CCS Directive.¹⁴⁸ As noted above, the operation of a geological storage requires a permit from a competent national authority.¹⁴⁹ This permit is important when it comes to delimitating the boundaries for monitoring and reporting of emissions under the EU ETS; they are based on how the storage site and storage complex are specified in this permit.¹⁵⁰

Since the storage operation is covered by the Trading Directive, Annex I, it also needs a greenhouse gas emissions permit, parallel with the storage permit. All emission sources from the injection facility shall be included in this permit.¹⁵¹ The guidelines for monitoring and reporting are found in MRG annex XVIII. Potential emissions sources are described as including fuel use and other combustion activities, vented and fugitive emissions from injection, breakthrough CO₂ from enhanced hydrocarbon recovery operations and leakage.

Combustion emissions from above ground activities shall be determined in accordance with MRG Annex II. This prescribes, amongst other things, that the monitoring of emissions from combustion processes shall include emissions from the combustion of all fuels at the installation as well as emissions from scrubbing processes; for example to remove SO₂ from flue gas. All emissions from the combustion of fuels at the installation shall be assigned to the installation, regardless of exports of heat or electricity to other installations. The amount of CO₂ vented shall be determined by using the emission measurement system according to Annex XII. In the monitoring plan, the operator shall provide an analysis regarding potential sources of fugitive emissions and a suitable documented methodology, based on industry best practice, to calculate or measure the amount.

If any leakage (defined as in the CCS Directive) from the storage complex results in emissions or release to the water column it will be considered as an emission source for the storage installation and monitoring shall start. Interesting here to note is that while the CCS Directive considers any release of CO₂ from the storage complex as leakage, quantification is only required where CO₂ is released into the air ('emissions') or into the water column. The leak will then be regarded as an emission source until no emissions or release into the water column from that leakage is detected anymore and the operator has notified the competent authority according to the CCS Directive.¹⁵²

As shown above, all emissions escaping from the CCS chain under the EU ETS must be covered by allowances, also when they originate from the capture installation or the transport system itself. This is logical since the installation that produced the captured CO₂ doesn't need to surrender allowances; if CO₂ is released to the atmosphere or water column somewhere along the chain, it must be covered. Otherwise the environmental integrity of the system might be endangered. Something else that might endanger this integrity is lack of experience with quantification of CO₂ released from storage sites into

¹⁴⁷ Fugitive emissions should be calculated by the operator using emission factors for equipment where fugitive emissions can be expected, such as valves, seals and measurement devices.

¹⁴⁸ Directive 2003/87/EC, Annex I.

¹⁴⁹ Directive 2009/31/EC, arts. 6(1) and 2 (2).

¹⁵⁰ MRG annex XVIII.

¹⁵¹ MRG annex XVIII.

¹⁵² This follows from 'corrective measures' pursuant to Article 16 of Directive 2009/31/EC.

the air/water: This uncertainty concerning quantification can be considerably higher than the average uncertainty of CO₂ monitoring in the existing EU ETS.

7.2. CCS activities NOT covered by the Trading Directive: Marine tankers

Transport of CO₂ by marine tankers is *not* covered by the EU ETS, simply because it is not mentioned in the Trading Directive's annex I. Consequently, there are no European guidelines for the transportation of CO₂ via shipping.¹⁵³ The main legal implication of this is that such transport does not require a permit to emit CO₂. It also means that the emissions from ship transports neither need to be monitored nor covered by allowances. In other words, the EU ETS does not put any legal obligations on the use of ships to transport CO₂. Under EU law, shipments of CO₂ for the purpose of geological storage have been excluded from the rules on shipments of waste but only to the extent that storage takes place in the EU.¹⁵⁴ Thus, there seem to be no significant legal obstacles to put CO₂ on marine tankers.

However, if an installation is to be released from the obligation to surrender allowances, the CO₂ must be verified as captured, transported and stored. Putting the CO₂ on a ship would break the chain of monitoring and covering emissions with EUAs. It is very unlikely that CO₂ transported by ship would count as 'verified transported' in the manner needed. A condition to be released from the obligation to surrender allowances is that the carbon dioxide is *verified* as captured, transported and stored.¹⁵⁵ This means that although no major legal obstacle exists, the incentive for the entire CCS chain is taken away if the CO₂ is put on a ship.

Would it then be possible for e.g. Sweden to unilaterally include shipping in the EU ETS?¹⁵⁶ The possibility to unilaterally include a certain type of activity (opt in) is regulated in the Trading Directive, article 24, giving two options; (a) if the inclusion refers to installations that are not covered by Annex I; or (b) if the inclusion refers to activities and greenhouse gases which are not listed in Annex I. The relevant option would be (b), since shipping is not an installation¹⁵⁷ but an activity not listed in Annex I.

An activity may be included unilaterally by applying emission allowance trading *in accordance* with the Trading Directive.¹⁵⁸ The allowed extent of opt in measures is unclear but this indicates that the Directive must be possible to use as it is. Next, the article expresses that supplements may only amend *non-essential elements* of the Directive. This indicates that amendments are allowed to some extent. However, the space seems to be very narrow. Primarily, the Trading Directive covers stationary installations. A stationary installation doesn't move; it is obvious in which State such an installation is

¹⁵³ The 2006 IPCC Guidelines for National Greenhouse Gas Inventories gives some recommendatory guidelines for the calculation of carbon dioxide emissions from marine vessels (see Marine Environment Protection Committee (MEPC) Circ. 471.); however, they don't apply within the EU ETS since shipping is not included.

¹⁵⁴ See Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste, Article 1(3), as amended by the CCS-Directive, Article 36. However, of specific importance for the transboundary movement of CO₂, Article 35 of the Directive 2009/31/EC, amends Article 2(1)(a) of the Waste Framework Directive categorically removing from the definition of 'waste', carbon dioxide captured and transported for the purposes of geological storage, provided it is geologically stored in accordance with the Directive 2009/31/EC. Furthermore, Article 36 of the Directive 2009/31/EC, removes CO₂ transport for the purpose of geological storage from the scope of the Transfrontier Shipment of Waste Regulation (Regulation (EC) No 1013/2006).

¹⁵⁵ Directive 2003/87/EC, Article 12, point 3a.

¹⁵⁶ This impediment has attracted the attention of the Swedish Government's memorandum on amendments to the Swedish regulatory framework needed to implement CCS Directive, p. 99 (Promemoria, Geologisk lagring av koldioxid, note 33 above) which, among other things, notes that the EU ETS currently does not permit sea transport of carbon dioxide. According to the memorandum Sweden should press for the long term including of maritime transport of carbon dioxide in the EU ETS or apply to have it unilaterally included in the EU ETS.

¹⁵⁷ An 'installation' is stationary technical unit (Directive 2003/87/EC, Article 3 e).

¹⁵⁸ Directive 2003/87/EC, Article 24 (b).

situated. The emissions are considered to take place in that State and the same State is responsible for the issuance of permit, the monitoring and the surrendering of EUA:s. A ship might originate from one country (the Flag State¹⁵⁹), be loaded with the captured CO₂ in another State (the Port State¹⁶⁰ if the vessel is loaded within a port or off-shore terminal of a State) and then move across the border to a third State (Coastal State¹⁶¹ if in its territorial sea;12 nautical miles from the so called baseline¹⁶²). Which of these States is to be responsible for potential emissions? The current Trading Directive cannot handle such a situation. There is a similar situation with aircrafts, which have been solved by an amending directive¹⁶³ but the aviation sector is not fully linked to the trading scheme: Operators of stationary installations covered by the scheme are not allowed to use allowances issued for aviation to cover their emissions, while aircraft operators are free to cover aviation emissions with allowances originally issued for either aircrafts or stationary installations.¹⁶⁴ This makes it impossible to refer ships to be handled in the same way as aircrafts, since they would be fully included as a part of the CCS chain. Nor do aircraft operators need a permit; instead each aircraft operator submits a monitoring plan to the competent authority in the administrating Member State.¹⁶⁵

In the end, it is for the Commission to decide whether a unilateral inclusion may be made and then all relevant criteria must be taken into account.¹⁶⁶ It seems unlikely that a unilateral inclusion would be considered having any significant effects on the European transportation market or potential distortions of competition since it would only include a very specific kind of transport. When it comes to the environmental integrity of the Community scheme, monitoring and reporting becomes essential. When looking at the MRG concerning transport in pipelines, all kinds of emissions are considered, not only the INPUT (see above). This means that also emissions generated by the transport system itself must be added to the total emissions (this is also the case in the MRG annex on capture). If following the MRG logic, the emissions from the ships themselves must be included when calculating emissions. This means that also the ships must be able to monitor and report their emissions and thus not only the cargo is affected. If choosing not to consider the emissions from the ship, the environmental integrity of the Community scheme might be questioned.

Irrespective of whether the including of shipping is unilateral or if it is done at the EU level, it must be coherent with United Nations Convention on the Law of the Sea (UNCLOS) which differentiates between different kinds of jurisdiction: Flag State-, Coastal State- and Port State-jurisdiction.¹⁶⁷ It also differentiates between legislative and executive jurisdiction. Legislative jurisdiction gives the State the competence to legislate, while executive jurisdiction defines to what extent the State can enforce rules. A certain State's competence to regulate shipping thus depends on the kind of jurisdiction it enjoys in a certain case. A Coastal State has jurisdiction over ships within its territorial sea. From an

¹⁵⁹ UNCLOS (see note 17, above), Article 91.

¹⁶⁰ UNCLOS, Article 218.

¹⁶¹ UNCLOS, Article 220.

¹⁶² UNCLOS, Articles 3, 5 and 7.

¹⁶³ Directive 2008/101/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (19 November 2008).

¹⁶⁴ Directive 2003/87/EC Article 6.2 (e) This is reasonable, since emissions from international aviation are not included in the UNFCCC/KP commitments. If stationary installations used aviation allowances, then the amount emissions allowed from the EU ETS sector would increase and thus risk the commitments under the UNFCCC/KP, while the aviation use of allowances from the stationary sector only decreases the emissions needed to count for in the UNFCCC/KP-context. Although not included in the UNFCCC/KP commitments, the Annex I-parties are still to strive to limit the emissions from the aviation sector as well as the maritime sector through measures within the *International Civil Aviation Organization* (ICAO) and the *International Maritime Organization* (IMO), see the Kyoto Protocol, Article 2.

¹⁶⁵ Directive 2003/87/EC, Article 3. This plan shall set out measures to monitor and report emissions and tonne-kilometre data. The plan is to be approved by the Member States' competent authorities according to guidelines from the Commission.

¹⁶⁶ Directive 2003/87/EC, Article 24.1.

¹⁶⁷ See notes 159-163, above.

environmental perspective this means that this State may regulate and control routes, define marine protection areas etc. Having said that, the State is not allowed to restrict the international principle of innocent passage or the passage through straits used for international navigation. Concerning ships exercising their right to innocent passage, the Coastal State may only adopt rules about construction; equipment etc if they reflect internationally accepted standards, i.e. rules laid down in international agreements. If ships are to monitor their emissions, some equipment would be required. When transporting CO₂ for geological storage the vessels will seek harbor in relevant countries, which means that those countries will act as Port States. Rules adopted by Port States may be enforced no matter which flag the ship flies, if they are necessary to protect the environment, proportional relative their purpose and non-discriminatory. This might be an alternative way of handling the equipment, though it is debatable whether it is possible to use environmental protection as an argument. It is easier for a Flag State to regulate the ships equipment, but then it will only be possible to use the Flag State's ships for transport. This might raise questions about discrimination and disproportionality.

The reason why transport by marine tankers is not initially included is probably that it is more legally complicated than pipelines (which are stationary). The solution can be something similar to the Aviation Directive though taking into consideration the particularities of ships. This is most probably best done at the EU level by means of harmonized measures.

8. Compatibility of rules in the three States concerned

The building of CCS infrastructure, including land- and sea based pipelines, possibly ports, and storage sites entails going through several permit procedures. These look different in different countries and the time required to obtain a particular permit may also vary significantly. The whole project may have to await the outcome of the most slow-moving permit procedure. The assessment of permits for individual parts of the project (e.g. a particular pipeline stretch) may also include assessments of the overall environmental and health impacts of the whole CCS-infrastructure. Ten years is not an overly pessimistic estimate of the time that may be needed for obtaining all necessary permits, should there be several appeals. It is also questionable whether a prospective operator would be willing to incur substantial costs, e.g. for carrying out an EIA-procedure and initiating a permit procedure for a CO₂ pipeline, without having reasonable assurances that the storage facility to which the pipeline is to be connected will also be approved. This may call for a more coordinated approach, at least with respect to governments and authorities in the countries concerned. A joint statement of intention and/or a joint regional strategy for CCS-infrastructure could send important signals about shared views and common intentions. This is not to say that such a political act could, or should, prejudge the judicial assessment of individual components of that infrastructure. It would, however, indicate a willingness to actively seek common solutions within the frames set by law and judicial review.

A joint regional strategy would also alleviate concerns associated with the different levels of familiarity with CCS-activities and the significant differences in political commitment and engagement displayed so far, e. g. between Norway and Sweden. Whereas technical compatibility is likely to be promoted by the application of international standards such as the DNV- Recommended Practice on design and operation of CO₂ pipelines, no similar coordination exists – except for the often vague minimum standards of the CCS-Directive and some other EU-legislation – on the political and regulatory side. But for regional CCS-projects to materialize they may be just as essential.

The EU Emissions Trading Scheme does not currently allow for captured CO₂ to be transported by ship as part of a CCS operation. Since the Trading Directive does not cover it, the situation is the same in all of the countries. However, if the Commission approves the unilateral inclusion of shipping in one Member State in the region the situation would be different.

9. Brief summary of the main legal challenges for CCS ahead as identified

Until an amendment to the London Dumping Protocol enters into force the export of CO₂ streams for geological storage in the seabed remains prohibited under international law. In May 2011 only one ratification of the amendment had been made. This calls for intensified efforts to bring this issue higher on the international political agenda and for constructive engagement with those weary of liberalization of international dumping regulation.

Both the operation of storage sites and the laying of pipelines will require permits from national authorities. A likely time frame for obtaining a permit for a sea-based CO₂ pipeline, including EIA, is between 3.5 and 8 years. The time frame for a storage site could be shorter but is hard to predict since there are few precedents.

Protected areas, particularly those designated as Natura 2000 areas, are likely to complicate the laying of pipelines from some major CO₂ point sources in the region. This needs to be studied in detail on a case-by-case basis.

Third-party access to CCS infrastructure has so far been given very little attention in the national implementation processes despite the risk that the vagueness of existing rules deters investors.

The whole CCS-chain is covered by the EU ETS and any CO₂ that is released into the air or the water column must be covered by emission allowances. Transport of CO₂ by marine tankers is currently not covered by the EU ETS, which, in practice, makes such transport unfeasible. Although unilateral inclusion of marine transport by individual Member State is not impossible, a formal amendment to the harmonizing EU rules is probably a prerequisite for such transport to be a viable option.

A joint regional CCS-strategy would alleviate concerns relating to the significant differences in political commitment and engagement displayed so far by the States concerned.