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EOR/CCS 360-DEGREE LEGAL REVIEW

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This report is intended as a high-level overview and is not intended to be a comprehensive review of all legal issues and developments in the relevant areas of law and practice.

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1 INTRODUCTION

This report will provide a high-level regulatory overview of the legal issues of importance for a combined Enhanced Oil Recovery (EOR) and Carbon Capture and Storage (CCS) project in Denmark.

Such a project proposes injection of captured CO₂ from, for instance, power plants or industrial installations in Denmark or another European Union (EU) Member State into selected oil reservoirs in the Danish North Sea, for the purpose of simultaneously increasing the volume of oil produced and permanently storing the injected CO₂. In this manner, the project will combine EOR with CCS.

The aim of the report is to assess the CCS and ETS regulation¹ applicable to a combined EOR and CCS project, as well as to review other applicable regulation in Denmark, including EU regulations and international conventions and agreements to which Denmark is a party. We will assess the applicable regulation with respect to the individual steps in the project cycle - i.e. the capture of the CO₂, its transportation by pipeline or ship, its injection and storage and the transfer of responsibility of the CO₂ storage site to the Danish State.

The scope of this report does not include a review of applicable tax, financing and state aid laws, or transportation laws (with respect to the transportation of CO₂ by ship).

It should be noted that there is a lack of clear and established practice on a number of issues of relevance to the contemplated project. Accordingly, it is not always possible to provide simple and definitive conclusions. Many of the issues will require further elaboration and will be subject to negotiation with relevant stakeholders.

2 EXECUTIVE SUMMARY

The EU has established a "cap-and-trade" scheme, the European Union Emissions Trading System (EU ETS), for the regulation and trading of greenhouse gas emission allowances as one of the initiatives to meet its greenhouse gas emissions reduction commitments. The EU ETS is regulated in the ETS Directive.²


There is a "cap" on the total emissions of greenhouse gases from certain installations, as specified in the ETS Directive. The covered installations must obtain a permit to emit a certain amount of greenhouse gases and by the end of the year they must surrender allowances covering their total emissions. There is only a limited amount of emission allowances, which can be "traded" by the comprised installations that can sell or buy allowances as needed.

Furthermore, the EU has adopted rules in the CCS Directive regarding the geological storage of CO₂ in the Member States in the CCS Directive.³ Under the CCS Directive the Member States have the right to decide whether or not they will allow CCS. Where the Member States allow CCS, the directive sets the legal framework for such activities.

¹ The ETS is the Emissions Trading System in the European Union, as further described in section 4 of this report.

² The European Parliament and of the Council's Directive no. 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC with subsequent amendments (the "ETS Directive").

³ The European Parliament and the Council's Directive no. 2009/31/EC of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, [...] (the "CCS Directive").



The EU ETS covers the following activities in a combined EOR and CCS project: capture, transportation by pipeline as well as storage of CO₂ in a storage site⁴ permitted under the CCS Directive.⁵ The EOR activities would be covered by the scheme governing the storage installation.

A ship transporting CO₂ for storage in a storage site permitted under the CCS Directive is currently not covered by the ETS Directive. However, a Member State may unilaterally apply to the European Commission for approval of inclusion of ship transportation of CO₂ in the EU ETS under Article 24 of the ETS Directive. This gives rise to several implications, for instance, regarding the content of monitoring and reporting rules.

The application of the EU ETS to capture, transportation by pipeline as well as storage of CO₂ entails that the installations engaged in these activities must obtain an emissions permit, and at the end of the year, surrender allowances equal to their CO₂ emissions.

Where the pipeline for transportation of CO₂ is located in more than one Member State, this gives rise to challenges regarding proper jurisdiction over the pipeline. With respect to the EU ETS emissions permit and the issuance and surrender of allowances, each Member State in principle has proper jurisdiction over any part of a pipeline installation that is located on its territory. Under the CCS Directive the Member States must, however, coordinate to ensure compliance with the CCS Directive and the ETS Directive.

With respect to the monitoring and reporting of CO₂ emissions, there is no obligation to surrender allowances in respect of emissions *“verified as captured and transported for permanent storage to a facility which has a permit under the CCS Directive”*.

Under the Monitoring and Reporting Regulation, the CO₂ capture installation can subtract from its total annual CO₂ emissions, the emissions which have been transferred out of the capture installation to a pipeline installation or to a storage site.

The captured CO₂ emissions, which the pipeline installation and the storage site receive from a capture or a pipeline installation, respectively, cannot be subtracted, however, neither can they be added to the installations' calculated level of emissions. The CO₂ emissions received by the pipeline installation and the storage site, respectively, do not affect the installations' total emissions, unless there are leakages from the installations.

In a combined EOR and CCS project, the CO₂ emissions from EOR activities are calculated towards the total CO₂ emissions from the storage site.


Since transportation of CO₂ by ship is currently not covered by the ETS Directive, no subtraction is allowed from the transfers of CO₂ to a ship. Any amount of CO₂ captured and transported by ship for storage is, therefore, not subtracted at the capture installation but is added to the capture installation's as well as the storage installation's total CO₂ emissions.

The CCS Directive sets the legal framework for the environmentally safe storage of CO₂ in the Member States whereby the CO₂ is permanently contained. EOR is not in itself included in the scope of the CCS Directive, however, the Directive applies where EOR is combined with geological storage of CO₂.

The storage of CO₂ requires an exploration permit as well as a storage permit, and financial security must be put in place towards the competent authority in a Member State to cover all obligations arising under the storage permit.

⁴ “Storage site” means a defined volume area within the geological formation used for the geological storage of CO₂ and associated surface and injection facilities, see Article 3, no. 3, of the CCS Directive.

⁵ Additionally, combustion of fuel at the oil and gas facility where the EOR and CCS activities are carried out is in itself encompassed under the EU ETS, provided that the combustion units of the installation have a total rated thermal input exceeding 20 MW.



The London Protocol and OSPAR Convention were amended in 2006 as well as 2009, and 2007, respectively, to allow the use and export of CO₂ for sequestration, but are silent as to the use of CO₂ for EOR. They will, most likely, be interpreted as not prohibiting the use and export of CO₂ for a combined EOR and CCS project where the exported levels of CO₂ are determined by what is needed for EOR.

Closure of a CO₂ storage site entails the definitive cessation of CO₂ injection into that storage site. Closure of a storage site can only take place if it has been approved by the competent authority. After the storage site has been closed, the operator remains responsible for certain obligations and liabilities under the CCS Directive, the ETS Directive and the EL Directive⁶.

Transfer of the responsibility of the storage site to the competent authority is conditional upon all available evidence indicating that the stored CO₂ will be completely and permanently contained and that a minimum of 20 years after the closure of the storage site has elapsed. Furthermore, the operator must make a financial contribution available to the competent authority to cover post-transfer obligation.

3 PROJECT DESCRIPTION AND STAKEHOLDERS

3.1 Overview of the combined EOR and CCS project

The first step of the envisaged combined EOR and CCS project is the capture of large volumes of anthropogenic CO₂ from one or more point sources such as power plants or industrial installations. The capture installations can be located in Denmark or in another EU Member State.

Once captured, the CO₂ may, in some cases, need to be purified to meet EOR and possibly CCS requirements.⁷

Transportation of the captured CO₂ to an oil and gas facility in the Danish North Sea will either be by pipeline or by ship. Pipeline transportation will be employed where large volumes of CO₂ are to be transported over shorter distances. Where smaller volumes of CO₂ are to be transported or transportation is required over longer distances, transportation by ship will be employed. In initial projects, including pilot projects, ship transportation would most likely be the preferred and most economical option.

Where transportation occurs via pipelines, the CO₂ will undergo compression prior to transportation. CO₂ compression will similarly be required in the case of transportation by ship which will additionally require the CO₂ to be liquefied. Separate loading facilities onshore as well as offloading facilities offshore will have to be established. In the event of transportation by ship, temporary onshore storage may be necessary for logistical reasons.

At the offshore facilities, the CO₂ will be injected into selected wells as part of the EOR process, in order to mobilise a portion of the oil that has not been capable of production with conventional techniques. The injection wells, the wells from where the mobilised oil is produced and the associated facilities will form a closed system, in which the CO₂ can circulate with no risk of any significant fugitive emissions or leakage, ensuring for all practical purposes permanent containment and permanent storage upon first injection.

The reservoir will be sealed when the EOR effects of injection and recirculation of CO₂ can no longer economically justify the continuation of the process.

⁶ The European Parliament and the Council's Directive no. 2004/35/CE of 21 April 2004 on environmental liability with regard to prevention and remedying of environmental damage with subsequent amendments (the "EL Directive").

⁷ The CCS Directive in Article 12 states the requirements to the contents of the CO₂ stream, and the EU Commission has issued a Guidance Document 2 to the CCS Directive regarding the composition of the CO₂ stream.

The individual steps may be illustrated as follows:



3.2 Stakeholders

Several authorities at both national and EU level are stakeholders in a combined EOR and CCS project. The main competent authorities are presented here, while their involvement and role in the project is described in further detail in the following sections of this report.

The principal relevant authority at the EU level is the European Commission. The Commission represents the interests of the EU as a whole. It proposes new legislation, and it ensures that EU law is correctly applied by the Member States. There are 27 Commissioners, one from each Member State.

The Commission – besides playing a key role in the drafting of existing EU CCS and ETS legislation – is involved in the opt-in procedure under the ETS Directive which is described in section 8.2 of this report. Under the opt-in procedure, a Member State may apply for the Commission's approval to unilaterally include activities not encompassed by the ETS Directive under the ETS scheme in that Member State.⁸

Member States are responsible for implementing EU legislation, when such implementation is required, as is the case with EU directives. The national implementation of EU legislation may, in some cases, lead to the application of different regimes in different Member States, as may be the case with third party access to CO₂ transportation pipelines described below in section 7.3. The focus of this report is Denmark and the implementation of EU legislation into Danish law.

In transboundary projects, the involved Member States are expected to cooperate directly on, for instance, emissions permits under the ETS Directive in relation to an offshore transboundary pipeline. Construction of an offshore pipeline also requires an Environmental Impact Assessment (EIA), which includes the conduct of a consultation process with affected Member States.

At the Danish national level, the competent authority, as mentioned in the relevant EU legislation, is primarily the Danish Energy Agency under the Danish Ministry of Climate, Energy and Building.

The Danish Energy Agency is the competent authority in Denmark as regards both CCS regulation and the ETS regime. The Agency's authority includes, inter alia, issuance of licences for storage of CO₂ in Denmark and for the construction and operation of offshore transportation pipelines. The Agency also administers emissions permits under the ETS.

⁸ To ensure a harmonised approach in the Member States, the Commission must receive and render an opinion on any storage permits and closure decisions to be issued by the competent authorities, see sections 9.4 and 10.2 of this report.

Other relevant Danish authorities include the local municipalities, the Environmental Protection Agency and the Nature Agency, which are involved in EIAs.

4 THE EUROPEAN UNION EMISSIONS TRADING SYSTEM

4.1 Introduction

The United Nations Framework Convention on Climate Change⁹ (UNFCCC) and the Kyoto Protocol¹⁰ to the UNFCCC provide an international legal framework for climate action in the EU.¹¹ The aim of the UNFCCC and the Kyoto Protocol is to stabilise greenhouse gas concentrations, including CO₂, in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.¹²

The EU has under the Kyoto Protocol undertaken binding commitments to limit or reduce its emissions of greenhouse gases by 8% as compared to 1990 levels over a five-year period from 2008 to 2012.¹³ The 8% reduction has been distributed among the EU Member States through legally binding agreements, the so-called burden sharing agreements.¹⁴

In 2003, the EU adopted the ETS Directive establishing a scheme for the regulation and trading of greenhouse gas emission allowances, as one of the initiatives to meet its reduction commitments under the Kyoto Protocol.¹⁵ This is known as the EU ETS.

The EU ETS is a "cap-and-trade" system in that there is a "cap" on the total emissions of certain greenhouse gases from, for instance, power and heat installation or industrial installations, as specified in the ETS Directive.

The installations encompassed by the scheme must obtain a permit to emit greenhouse gases specifying the amount of emissions of greenhouse gases; and by the end of each year they must surrender allowances covering their emissions.¹⁶ One allowance grants the right to emit the equivalent of one tonne of CO₂.¹⁷

⁹ The United Nations Framework Convention on Climate Change, which was adopted in New York on 9 May 1992 and which entered into force on 21 March 1994.

¹⁰ The Kyoto Protocol to the United Nations Framework Convention on Climate Change, which was adopted in Kyoto on 11 December 1997 and which entered into force on 16 February 2005.

¹¹ The EU is an Annex I party to the UNFCCC and an Annex B party to the Kyoto Protocol, see the Council's Decision of 15 December 1993 concerning the conclusion of the UNFCCC (1994/69/EC) and the Council's Decision of 25 April 2002 concerning the approval, on behalf of the EC, of the Kyoto Protocol to the UNFCCC and the joint fulfilment of commitments thereunder (2002/358/EC), respectively.

¹² See Article 2 of the UNFCCC.

¹³ The commitment period for the EU under the Kyoto Protocol will expire on 31 December 2012. No follow-up commitments have been adopted yet for the second commitment period from 1 January 2013 to 31 December 2017.

¹⁴ See Decision No. 2002/358/EC.

¹⁵ The ETS Directive has been implemented in Denmark in consolidated act no. 1222 of 15 October 2010 on CO₂ Allowances with subsequent amendments (Kvoteloven).

¹⁶ Installations or parts of installations used for research, development and testing of new products and processes are not covered by the Directive, see Annex I, paragraph 1 of the ETS Directive.

¹⁷ "Allowance" is defined in Article 3(a) of the ETS Directive as an allowance to emit the equivalent of one tonne of CO₂ during a specified period in accordance with the ETS Directive. An allowance issued under the EU ETS is called an EUA.

The emission allowances are either granted to the installations for free or auctioned off, and there is only a limited amount of emission allowances. Therefore, the allowances can be “traded” such that the installations can sell or buy allowances, as needed.

The installations covered by the scheme are installations carrying out the activities exhaustively listed in Annex I of the Directive.¹⁸ These installations include energy producing installations carrying out combustion of fuels in installations with a total rated thermal input exceeding 20 MW¹⁹, as well as industrial installations producing, for instance, steel, aluminium, pulp from timber, paper or chemicals.

From 2013 onwards the EU ETS also covers installations which either i) capture CO₂ from installations encompassed by the ETS Directive for the purpose of transport and storage, ii) transport CO₂ by pipelines for storage or iii) store CO₂, provided, with respect to each of these three scenarios, that the CO₂ is stored on a storage site permitted under the CCS Directive.²⁰

The installations must monitor and report their emissions and must, at the end of the year, surrender allowances equal to the total emission from the installation that year.

If the emissions from the installation at the end of the year exceed what is permitted to be emitted for such installation, and such installation requires extra allowances over and above what it has been freely allocated, if any, to cover its total emissions, the installation can purchase allowances from other installations or from an exchange, for instance, the European Energy Exchange (EEX) or the NASDAQ OMX Commodities Europe. Likewise, such installation can sell any left-over allowances, if it has reduced its emissions.

Emissions credits from the project mechanisms under the Kyoto Protocol, i.e. the Joint Implementation (JI)²¹ and the Clean Development Mechanism (CDM)²², are considered equivalent to the EU emission allowances, and can be surrendered under the EU ETS by the installations.²³

¹⁸ An installation is a stationary technical unit where one or more activities listed in Annex I are carried out and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions and pollution, see Article 3(e) of the ETS Directive.

¹⁹ To determine the total rated thermal input of an installation, the rated thermal inputs of all technical units which are part on an installation, in which fuels are combusted, are added together. The technical units could include all types of boilers, burners, turbines, heaters, furnaces, incinerators, calciners, kilns, ovens, dryers, engines, fuel cells, chemical looping combustion units, flares, and thermal or catalytic post-combustion units, see Clause 3 of Annex I to the ETS Directive.

²⁰ The ETS Directive was amended by the European Parliament and the Council's Directive no. 2009/29/EC of 23 April 2009 (the “Amendment Directive”) to include, inter alia, CCS activities in the EU ETS.

²¹ JI projects allow an Annex B Party to the Kyoto Protocol with an emission reduction or limitation commitment to earn emission reduction units (ERUs) from an emissions reduction or removal project in another Annex B Party. An ERU is equivalent to one tonne of CO₂ and can be calculated towards the Kyoto targets.

²² CDM projects allow an Annex B Party to the Kyoto Protocol to implement an emissions reduction project in developing countries. Such projects earn saleable certified emission reduction (CER) credits, each equal to one tonne of CO₂, which can be calculated towards the Kyoto targets.

²³ See the European Parliament and the Council's Directive no. 2004/101/EC of 27 October 2004 amending the ETS Directive, in respect of the Kyoto Protocol's project mechanisms (the Linking Directive). As a starting point, only credits from JI projects and CDM projects registered before 31 December 2012, can be surrendered under the EU ETS. Further, the supplementary principle from the Kyoto-protocol has been implemented in the ETS Directive Article 11(a)(8), and Kyoto credits may, therefore, only constitute a maximum of 50% of the EU's reduction targets. In order to maintain a proper market price on EUA, the Commission is currently considering to limit the access of international credits to the ETS, see the report from the Commission to the European Parliament and the Council on the state of the European carbon market in 2012, COM (2012)652, chapter 4.5.

During the first phase of the ETS, which ran from January 2005 to December 2007, the installations primarily received free allowances in accordance with national allowance plans administered by the Member State where the installation was located. This same arrangement applies in the second phase, which runs from January 2008 until December 2012.²⁴

During the third phase, which will run from January 2013 to December 2020, there will be a Community-wide quantity of allowances issued each year.²⁵ The Member States must auction all allowances to the power sector, whereas there will be a transitional system for free allocation based on harmonised benchmarks to other sectors, including under certain conditions, heat installations, oil and gas facilities, and industrial installations.²⁶ The auctions will be carried out by the EEX.²⁷

Where countries outside the EU do not have a scheme for limiting emissions such as the ETS, this could lead to an increase in greenhouse gas emissions in such countries, for instance, by carbon emitting industries in the EU relocating to countries, whereby 'carbon leakage' occurs. To address the risk of carbon leakage the Member States may allocate free allowances to sectors or sub-sectors listed in Commission's Decision 2010/2/EC, which are deemed to be exposed to a significant risk of carbon leakage.²⁸ The sectors and subsectors listed in the Decision are industrial installations.

There is no free allocation of allowances to capture and storage of CO₂. According to the Directive, the incentive for these activities is the exclusion from the surrender requirement, as allowances must not be surrendered in respect of emissions which are stored in a storage site permitted under the CCS Directive.²⁹

The cost of the allowances, i.e. the carbon price, is market based. The carbon price has decreased from a peak price of €30/tCO₂ during 2008 to a price of €8.49/tCO₂ at the EEX on 13 November 2012.³⁰

In order to facilitate an increase in the carbon price, the Commission has proposed to delay the sale of 900 million allowances of the 3.5 billion allowances³¹ expected to be sold in 2013-2015 towards the end of phase 3 running until 2020.³² Therefore, there are currently discussions at EU level about the Commission's proposal and the future amount of allowances and structure of the EU ETS.

²⁴ The main arrangement in phases 1 and 2 of the EU ETS was free allocation, the so-called grandfathering, of allowances. However, EU Member States were permitted to auction or sell up to 5% of allowances in phase 1 and up to 10% in phase 2.

²⁵ The quantity will decrease by a linear factor of 1,74% compared to the average annual total quantity of allowances issued by Member States in accordance with the Commission Decisions on their national allocation plans for the period from 2008 to 2012, see Article 9 of the ETS Directive.

²⁶ For other sectors, free allocation in 2013 would be 80% of the amount that corresponded to the percentage of the overall Community-wide emissions throughout the period from 2005 to 2007 which those installations emitted as a proportion of the annual Community-wide total quantity of allowances. The free allocation will afterwards decrease each year by equal amounts resulting in 30% free allocation in 2020 and no free allocation in 2027.

²⁷ The European Commission has appointed EEX as the common auction platform to auction Phase 3 allowances on behalf of 24 Member States, including Denmark, see http://ec.europa.eu/clima/news/articles/news_2012091001_en.htm

²⁸ See the Commission's Decision 2010/2/EU of 24 December 2009 stipulating, pursuant to the ETS Directive, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, as amended by the Commission's Decision 2011/745/EU of 11 November 2011.

²⁹ See Article 10a.3 of the ETS Directive and recital 19 of the preamble of the Amendment Directive.

³⁰ This is the price on the EEX from the first auction for emissions allowances held on 13 November 2012, setting the price for the phase III allowances, see <http://www.eex.com/en/Market%20Data/Trading%20Data/Emission%20Rights>.

³¹ The 3.5 billion allowances include aviation allowances and NER300 allowances, see the European Commission's memo 12/600 of 25 July 2012 regarding Q&A Emissions Trading: Commission Prepares to change the time profile for auctions of emission allowances.

³² See the Commission's draft amendment for regulation 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-2020, http://ec.europa.eu/clima/news/articles/news_2012111203_en.htm.

4.2 Application of the ETS Directive to CCS and EOR

The EU has adopted a directive regarding the geological storage of CO₂ in the Member States (the CCS Directive). Under the CCS Directive the Member States have the right to decide whether or not they will allow CCS. Where the Member States allow CCS, the directive sets the legal framework for such activities.

With respect to CCS activities, the EU has also decided that from 2013 onwards the ETS Directive in Annex 1 encompasses installations engaged in the: ³³

- capture of CO₂ from installations covered by the ETS Directive for the purpose of transport and storage,
- transport of CO₂ by pipelines for storage, and
- storage of CO₂.

EOR, as an activity in itself, is not encompassed by the Directive, as it is not listed in Annex I of the Directive. However, in a combined EOR and CCS project, the EOR activities would be covered by the scheme governing the storage installation.

The storage installation must monitor and report, as part of its total CO₂ emissions, on use of fuel by associated booster stations and other combustion activities including onsite power plants, venting and fugitive emissions from injection, as well as from enhanced hydrocarbon recovery operations and leakages.³⁴

A ship transporting CO₂ for storage in a storage site permitted under the CCS Directive is currently not encompassed by the ETS Directive, as it is not listed in Annex I of the Directive.

Under Article 24 of the ETS Directive, the so-called opt-in article, Member States may apply for the Commission's approval to unilaterally include activities and greenhouse gases which are not listed in Annex I under the scheme in that Member State.³⁵ Therefore, it is possible for Member States to decide to include ship transport of CO₂ for storage in a storage site permitted under the CCS-Directive under the scheme. If these activities are included in the scheme, the activities will require emission permits, as well as allowances to cover the emissions from the activities.³⁶

Article 24a of the ETS Directive further sets out that implementing measures may be adopted, which provides for the issuing of allowances for projects that reduce greenhouse gas emissions but are not covered by the EU ETS.

The processes for inclusion of ship transportation of CO₂ under Articles 24 and 24a of the ETS Directive are further elaborated upon in section 8.2 of this report.

³³ See Annex I of the ETS Directive. It is a condition under Annex I that the CO₂ is stored in a storage site permitted under the CCS Directive.

³⁴ This is elaborated further in section 9.2 of this report.

³⁵ The approval of the Commission must be in accordance with the regulatory procedures in Article 23 of the ETS Directive.

³⁶ On the initiative of the Commission, or at the request of a Member State, a regulation may be adopted concerning the monitoring of, and reporting on, emissions concerning activities, installations and greenhouse gases which are not listed as a combination in Annex I, if that monitoring and reporting can be carried out with sufficient accuracy.

4.3 Emissions permits and allocation of allowances for CCS and EOR

All installations encompassed by the ETS Directive must obtain an emissions permit from the competent authority for emissions of the greenhouse gases specified in the Directive, including emissions of CO₂.³⁷ An emissions permit is, therefore, required for capture, transport by pipeline and storage of CO₂, respectively, being installations covered by the ETS Directive. In a combined EOR and CCS project, the emissions permit for the storage installation will also cover certain emissions from the EOR activities.

A ship transporting CO₂ for storage in a storage site permitted under the CCS-Directive is currently not encompassed by the ETS Directive, and an emissions permit is therefore not required for this activity.

Where several installations are operated by the same operator at the same site, or where the installation with the capture facility is an energy producing installation or an industrial installation also carrying out an activity listed in Annex I, the installations or the activities, respectively, may be covered by one emissions permit.³⁸

The emissions permit contains a description of the activities and emissions from the installation. Therefore, all emission sources and source streams from activities listed in Annex I to the ETS Directive that are to be monitored and reported must be listed in the permit.³⁹ The permit also contains monitoring requirements, specifying monitoring methodology and frequency.

The operator of the installation is the party responsible for obtaining the emissions permit and for carrying out and fulfilling the monitoring, reporting and other obligations under the ETS Directive.⁴⁰ For instance, the operator must inform the competent authority of any planned changes to the nature or functioning of the installation, or any extension or significant reduction of its capacity, which may require an update of the emissions permit.⁴¹

4.4 Monitoring and reporting requirements for CCS and EOR

Each operator of an installation must monitor and report the emissions from an encompassed installation during each calendar year to the competent authority in its Member State after the end of that year in accordance with the monitoring and reporting requirements in the emissions permit and the Monitoring and Reporting Regulation.⁴² The reports submitted by the operators must be verified in accordance with the criteria set out in Annex V of the ETS Directive and the Verification Regulation.⁴³

³⁷ In Denmark, the emissions permit must be obtained by the Danish Energy Agency.

³⁸ See Article 6(1) of the ETS Directive.

³⁹ See Article 6(2) of the ETS Directive.

⁴⁰ Operator is defined as any person who operates or controls an installation or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the installation has been delegated, see Article 3(f) of the ETS Directive.

⁴¹ See Article 7 of the ETS Directive. Where there is a change in the identity of the installation's operator, the competent authority must update the emissions permit to include the name and address of the new operator.

⁴² The Commission's Regulation (EU) no. 2012/601 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.

⁴³ The Commission's Regulation (EU) no. 2012/600 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council.

The operator of each installation must, by 30 April the subsequent year, surrender for cancellation a number of allowances equal to the total emissions from that installation during the preceding calendar year as verified.⁴⁴

There is no obligation to surrender allowances in respect of emissions “*verified as captured and transported for permanent storage to a facility which has a permit under the CCS Directive*”.⁴⁵

It is not specified in the ETS Directive, whether a specific means of transportation of CO₂ is required in order to be exempt from the obligation to surrender allowances. However, the ETS Directive in Annex 1 only covers transportation of CO₂ by pipeline, as specified in section 4.2 of this report.

The Monitoring and Reporting Regulation further specifies the requirements for monitoring, reporting and calculating CO₂ emissions from the capture, transport and geological storage of CO₂.

Under Article 49 of the regulation the operator can subtract from the emissions of the installation any amount of CO₂ originating from fossil carbon in activities encompassed by Annex I to the ETS Directive, i.e. capture, transport and storage of CO₂ under the CCS Directive, which is not emitted from the installation, but is transferred out of the installation to any of the following:

- (a) a capture installation for the purpose of transport and long-term geological storage in a storage site permitted under the CCS Directive,
- (b) a transport network⁴⁶ with the purpose of long-term geological storage in a storage site permitted under the CCS Directive, or
- (c) a storage site permitted under the CCS Directive for the purpose of long-term geological storage.

This entails that the capture installations can only subtract from their total emissions, the emissions which have been verified as *captured* and *transported* for permanent storage, i.e. the CO₂ emissions that have been transferred out of the capture installation to a pipeline installation or to a storage site can be subtracted.

The pipeline installation for transport of CO₂ and the storage site cannot subtract the emissions which have been verified as captured and transported for permanent storage from their total emissions. However, the captured CO₂ emissions that the pipeline installation and the storage installation receive from a capture or a pipeline installation, respectively, are not added to the installation’s calculated level of emissions.⁴⁷ I.e. the CO₂ emissions that have been transferred to the pipeline installation and the storage installation, respectively, do not affect the installations’ total emissions, unless there are leakages from the installations.

Leakage incidents in a transport network must be included as emission sources for the pipeline installation, and must be monitored accordingly.⁴⁸ Similarly, where leakages from a storage complex⁴⁹ are iden-

⁴⁴ See Article 12(3) of the ETS Directive.

⁴⁵ See Article 12(3a) of the ETS Directive.

⁴⁶ A “transport network” is defined as network of pipelines, including associated booster stations, for the transport of CO₂ to the storage site, see Article 3, no. 22, in the CCS Directive.

⁴⁷ This applies to pipeline installations that use calculation method B. The installations that use calculation method A must calculate the overall mass balance of all input and output streams, including CO₂ transferred in and out of the installation, see Annex IV of the Monitoring and Reporting Regulation.

⁴⁸ See section 22-23 of Annex IV of the Monitoring and Reporting Regulation.

tified and lead to emissions, or CO₂ is released into the water column, such emissions must also be included as emission sources for the storage installation, and must be monitored accordingly.⁵⁰

It follows from Article 49 of the Monitoring and Reporting Regulation, that no subtraction of CO₂ is permitted from the installation's emissions for transfers of CO₂ out of the installation, other than the transfers listed in the article.⁵¹

Ship transportation of CO₂ is currently not an activity encompassed by Annex I of the ETS Directive or listed in article 49 of the Regulation. Since no subtraction is allowed from transfers of CO₂ other than the transfers listed in article 49, the transfer of CO₂ out of a capture installation to a ship for transportation of the CO₂ to a storage site permitted under the CCS Directive cannot be subtracted from the CO₂ emissions of the capture installation. This means that the CO₂ emissions captured and transported by ship for storage are added to the capture installation's as well as the storage installation's total CO₂ emissions.

If ship transportation of CO₂ is included in a Member State's scheme under the opt-in option in article 24 of the ETS Directive, the Commission may, at its own initiative, and must at the request of a Member State, adopt rules for monitoring and reporting for this activity, if monitoring and reporting of emissions from this activity can be carried out with sufficient accuracy, see sections 4.2 and 8.2 of this report.⁵²

Annex IV of the Regulation specifies the emission sources and the monitoring methodologies for capture, transport and storage of CO₂, respectively.⁵³ The Annex, for instance, specifies how storage installation must monitor emissions from the injection of CO₂ as well as EOR activities.⁵⁴

The emission sources and monitoring methodologies are further elaborated in the sections of this report covering the individual steps of the project chain.

4.5 Transboundary projects

The physical location of the installation is decisive in determining which Member State's scheme applies to the installation and which authority is the competent authority to ensure compliance with the scheme, including the granting of an emissions permit.⁵⁵

The ETS Directive does not address which authority is the competent authority in the case of a transboundary installation located in different Member States, such as a pipeline for transport of CO₂ for storage in a storage site permitted under the CCS Directive, which starts in one Member State and ends in another Member State.

⁴⁹ "Storage complex" means the storage site and surrounding geological domain which can have an overall storage integrity and security, that is, secondary containment formations, see Article 3, no. 6, of the CCS Directive.

⁵⁰ The leakage may be excluded as an emission source subject to approval by the competent authority, when corrective measures pursuant to Article 16 of the CCS Directive have been taken and emissions or release into the water column from that leakage can no longer be detected, see Article 20(3) of the Monitoring and Reporting Regulation.

⁵¹ See Article 49(1) of the Monitoring and Reporting Regulation.

⁵² Guidelines for monitoring and reporting requirements, including emission sources, for the transportation of CO₂ by ship may be found in the API's Compendium from August 2009 on greenhouse gas emissions methodologies for the oil and natural gas industry, section 2.2.5, as well as the IPCC Guidelines from 2006 for National Greenhouse Gas Inventories, Volume 2 regarding Energy, Chapter 5 regarding Carbon Dioxide Transport, Injection and Geological Storage.

⁵³ See sections 21-23 of Annex IV of the Monitoring and Reporting Regulation.

⁵⁴ See section 23 of Annex IV of the Monitoring and Reporting Regulation.

⁵⁵ The CCS Directive applies to CCS in the territory of the Member States, their exclusive economic zones and on their continental shelves within the meaning of the United Nations Convention on the Law of the Sea (UNCLOS). See section 7.4 of this report.

It is, therefore, uncertain which Member State or if both Member States must grant an emissions permit to a transboundary installation, and if the installation must surrender allowances to one or both Member States, see further section 7.2 of this report.

It follows from the CCS Directive that in case of the transboundary transport of CO₂, transboundary storage sites or transboundary storage complexes, the competent authorities of the Member States concerned must jointly meet the requirements of the CCS Directive and of other relevant Community legislation.

Therefore, the competent authorities concerned as regards, for instance, a pipeline for the transportation of CO₂ must cooperate to ensure that the requirements in the CCS Directive and the ETS Directive are met.

The CCS Directive and the ETS Directive are not directly applicable in the Member States, but must be implemented into the Member States' national legislation. The Member States are obliged to meet the requirements and the underlying objectives of the Directives. However, the CCS Directive only provides a legal framework and the detailed regulation of CCS is left up to the Member States which may lead to inconsistent implementations of the Directive in the different Member States. This may give rise to challenges in the collaboration between Member States in transboundary CCS projects.

5 SUBSIDY SCHEMES

5.1 European Economic Recovery Plan

In 2008, the European Union established the EERP, in response to the global financial crisis with a funding of €200 billion available to stimulate the economy.⁵⁶

€5 billion was available for distribution through the European Energy Programme for Recovery (EEPR) to three types of projects: gas and electricity infrastructure, offshore wind energy and carbon capture and storage.⁵⁷

Almost 97% of the available funds for energy projects were committed to different projects by the EEPR by the end of 2010, whereof €1 billion were committed for CCS projects.⁵⁸ There is no procedure for accepting new projects to the programme. The following six CCS projects have received funding or a promise of funding from the EEPR:

- Jämschwalde, Germany (Vattenfall Europe Generation Vattenfall Europe Carbon Storage)
- Porto Tolle, Italy (ENEL)
- ROAD, the Netherlands (Maasvlakte CCS Project C.V.)
- Belchatow, Poland (PGE Górnictwo i Energetyka and Konwencjonalna)⁵⁹

⁵⁶ See communication from the Commission COM(2008)800 on a European Economic Recovery Plan, p. 13.

⁵⁷ The EEPR was set up under Regulation no. 663/2009, establishing a programme to aid economic recovery by granting Community financial assistance to projects in the field of energy. See Article 1 of the Regulation.

⁵⁸ See the Commission's Report COM(2012)445 on the Implementation of the European Energy Programme for Recovery, pp. 2 and 8.

⁵⁹ The status of the project is currently unknown. The developers of the project have suspended investments, possibly pending further public funding. See <http://www.zeroco2.no/projects/belchatow>.

- Compostilla, Spain (Endesa Generacion, Fundacion, Ciudad de la Energia (Ciuden), and Foster Wheeler Energia Oy)
- Don Valley, UK (2Co Power).⁶⁰

The latest report from the Commission on the programme concludes that the chosen CCS projects are not as advanced as was hoped. One project (Jämschwalde) has been cancelled and several have been delayed.⁶¹ Any funds from the cancelled CCS project, which have not been spent, must be returned to the EEPR.⁶²

The remaining €146 million which was not allocated by the EEPR through a call for proposals have been put into the European Energy Efficiency Fund (EEEF).⁶³ The fund will also receive any remaining funds that cannot be distributed to projects or which have been returned, for instance, because the project has been cancelled. The fund invests in energy efficiency and renewable energy projects in the range of €5 to €25 million.⁶⁴ However, CCS projects do not qualify for funding from the EEEF. Discussions concerning in what manner other CCS projects may benefit from the remaining funds which are available from the EEPR are on-going at EU level.

5.2 NER300

The NER300 subsidy scheme is financed by the sale of 300 million emission allowances from the New Entrants Reserve (NER) under the ETS Directive. The revenues from the sale will be used for the funding of demonstration projects concerning the environmentally safe capture and geological storage of CO₂, as well as concerning innovative renewable energy technologies.

The financing available for CCS projects is reserved for projects demonstrating the technology on a full, commercial scale.⁶⁵

In order to secure that the available funds are distributed to the best effect, a number of projects in each category should receive funding, spread out geographically. It was originally anticipated that the NER300 programme would be able to co-fund, at least, eight CCS projects and 34 RES projects.⁶⁶ Of the eight CCS projects, at least three projects should demonstrate techniques in hydrocarbon reservoir storage and at least three projects should demonstrate techniques in saline aquifer storage.⁶⁷ Projects which combine CCS and EOR are eligible for funding.⁶⁸

The NER300 funds will be distributed in two rounds prior to 2015. The first round of call for proposals, which was closed in 2011, will distribute funds from the sale of the first 200 million emission allowances.

⁶⁰ The United Kingdom has announced that the Don Valley Project is no longer part of the United Kingdom's submission for NER300-funding, see http://www.decc.gov.uk/en/content/cms/news/pn12_136/pn12_136.aspx. The status of the project is currently unknown, see http://www.2coenergy.com/latest_news.html.

⁶¹ See the Commission's Report COM(2012)445, pp. 8-9.

⁶² http://sequestration.mit.edu/tools/projects/vattenfall_janschwalde.html

⁶³ See the Commission's Report COM(2012)445, p. 2, and recital 7 of the preamble of Regulation no. 663/2009. This is also regulated by Regulation no. 1233/2010 which amends Regulation 663/2009.

⁶⁴ <http://www.eeef.eu/eligible-investments.html>. The EEEF must spend the money by 31 December 2014. Funds not allocated by that time will revert to the general EU budget, see Article 1(2)(b) of Regulation no. 1233/2010.

⁶⁵ See the Commission's "Call for proposals concerning the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO₂, as well as demonstration projects of innovative renewable energy technologies [...], sections 3 and 3.

⁶⁶ See recital 11 of the preamble of the Commission's Decision 2010/670/EU of 3 November 2010 laying down criteria and measures for the financing of commercial demonstration projects [...] (the "NER300 Decision").

⁶⁷ See recital 11 of the preamble of the NER300 Decision.

⁶⁸ See "Questions and Answers on the NER300 programme and the first call for proposals" (the "NER300 FAQ"), question no. 189.

The second round, which will distribute funds from the sale of the last 100 million allowances and any remaining funds from the first round, will be opened after a review of the sales for the first round.⁶⁹

The 200 million emission allowances for the first round have been sold and the available funds for projects will amount to €1.5 billion in total.⁷⁰ As this is significantly lower than anticipated due to the decreasing market value of emission allowances, fewer projects will be supported than initially expected.⁷¹ The division of funds between CCS projects and RES projects is 60% and 40%, respectively, resulting in about €900 million being made available for the funding of CCS projects.⁷²

Projects are submitted through the Member States to the European Commission, as it is expected, though not required, that the Member States will co-fund the projects.⁷³ The Member States are responsible for collecting the applications and evaluating the projects initially on the basis of the eligibility criteria.⁷⁴ The Member States decide which projects to submit and whether to withdraw a project from the process. However, the final award decision is made at EU level.⁷⁵

Funding can be granted for up to 50% of a project's "relevant costs".⁷⁶ The "relevant costs" are those which are borne by the project because of the application of CCS during the first 10 years of operation, and the extra cost for allowing the technology to be demonstrated.⁷⁷ This includes investment in land, plant and equipment as well as the net extra operating cost from applying the technology.⁷⁸ "Operational benefits", such as existing support schemes, avoided costs and existing tax incentive measures, should be deducted from the extra operating cost.⁷⁹

While the projects have to be tied to a Member State's territory, part of the project may involve other Member States. The transportation of CO₂ from a capture installation to a storage site complies, therefore, with the applicable criteria.⁸⁰ The requirements of the CCS-directive must be met by the Member States involved, which also have to agree on questions of risk-sharing.⁸¹ Sponsors of transboundary projects have to submit completed documentation to all Member States the territory of which is tied to the project. The Member States are then responsible for agreeing which Member State should be the Lead Member State. The Lead Member State submits the project to the Commission.⁸²

⁶⁹ The reason for having a second round of call for proposals is, inter alia, to adjust any technological or geographical imbalance from the first round, see recital 9 of the preamble of the NER300 Decision.

⁷⁰ <http://www.ner300.com/?p=207>. The total revenue from sale of the 200 million emissions allowances was €1.6 billion, whereas the €1.5 billion is the amount available after deduction of fees and expenses.

⁷¹ Originally €4.5 billion was expected as available funding based on the price for allowances at the time when the programme was initiated, cf. NER300 FAQ, question 3.

⁷² See Commission Staff Working Document SWD(2012)224, NER300 – Moving towards a low carbon economy and boosting innovation, growth and employment across the EU (the "Commission SWD(2012)224"), section 9.

⁷³ See NER300 FAQ, question no. 8.

⁷⁴ It is, for instance, an eligibility criterion that each project has to implement the full chain, i.e. capture, transport and storage, see Annex I of the NER300 Decision.

⁷⁵ See recital 7 of the preamble of the NER300 Decision.

⁷⁶ See Article 3(3) of the NER300 Decision.

⁷⁷ See Article 3 of the NER300 Decision.

⁷⁸ See NER300 FAQ, question no. 13.

⁷⁹ See Article 3(5) of the NER300 Decision and NER300 FAQ, question no. 103. Operational benefits also include income from feed-in tariffs, NER300 FAQ, question no. 44, and extra profit from production of oil in a CCS project compared to production without injection, NER300 FAQ, question no. 209.

⁸⁰ See NER300 FAQ, question no. 10.

⁸¹ See NER300 FAQ, question no. 70.

⁸² See the Commission's "Call for proposals concerning the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO₂, as well as demonstration projects of innovative renewable energy technologies [...]", section 133. The Member State that receives an application must contact the other involved Member States to reach a common decision regarding the project.

If a CCS project involves transport of CO₂ by ship, this activity would have to be opted into the EU ETS pursuant to Article 24 of the ETS Directive.⁸³ The details of this, including corresponding monitoring and reporting obligations, would be specified in the opt-in Decision.

The NER300 funds can be combined with other programmes from a Member State or from the EU, including financing from the EEPR.⁸⁴ However, the Funding from the NER300 will be reduced by any amount granted by the EEPR.⁸⁵ The eligible projects are categorised and ranked on the basis of lowest cost-per-unit.⁸⁶ The highest ranked projects will receive funding.

With the €900 million of available funds from the first round designated for CCS projects, it is expected that two to three CCS projects will receive funding.⁸⁷ The NER300 will provide up to 50% of the required funding for each of the awarded projects but a project cannot receive more than 15% of the available funds.⁸⁸

A preliminary list of candidates for NER300 award decisions has been published.⁸⁹ The list states the projects in the current order of selection for an award decision, though, it is subject to change, for instance, if a project is withdrawn or deselected by the submitting Member State. The final list may be adopted by the EU Climate Change Committee by the end of 2012, after which the award decisions will be made.⁹⁰

Disbursements of funds for selected CCS projects will take place annually on the basis of the amount of CO₂ stored, as reported, monitored and verified in accordance with the ETS Directive.⁹¹ A project that successfully achieves 75% of what was expected, will still receive the full amount of funding. If the project achieves less than 75%, funding will be proportionally reduced.⁹² Even though the disbursements are made annually, a project will have to adhere to the 75% mark in the 10-year period as a whole.⁹³ Finally, the disbursement can only be made on the condition that certain knowledge-sharing requirements regarding the project are met.⁹⁴

CCS projects should be designed for a capture rate of at least 85%. Any reduced capture rate will make it harder to achieve the proposed performance, and if there is any shortfall below 75%, funding from the NER300 will be reduced accordingly.⁹⁵

Funds which a Member State returns or which are never distributed because of under performance of the project, stays with the European Investment Bank, which manages the funds on behalf of the Commission. These funds will be used for co-financing other demonstration projects until 31 December 2015. Thereafter, any remaining funds will be passed on to the Member States.⁹⁶

⁸³ See NER300 FAQ, question no. 266. This could be interpreted to mean that where a proposed project involves transport of CO₂ by ship, it is an eligibility criterion to receive NER300 funding that ship transportation is opted-in under Article 24 of the ETS Directive.

⁸⁴ See recital 5 of the preamble of the NER300 Decision and NER300 FAQ, question no. 8.

⁸⁵ See Article 2(3) of the NER300 Decision.

⁸⁶ See NER300 FAQ, question no. 16 and recital 12 of the preamble of the NER300 Decision.

⁸⁷ See the Commission SWD(2012)224, Annex I.

⁸⁸ See recital 6 of the preamble and Article 2(3) of the NER300 Decision. Given the large costs related to CCS projects, the funding that CCS projects will receive from the NER300 will only cover a smaller part of the costs related to the projects.

⁸⁹ See the Commission SWD(2012)224, Annex I.

⁹⁰ See Commission SWD(2012) 224, section 14.

⁹¹ A Member State can, however, release the funding beforehand if it guarantees to return excess funding to the European Investment Bank, see Article 11(5) of the NER300 Decision.

⁹² See Article 11(2) of the NER300 Decision.

⁹³ See NER300 FAQ, question no. 58.

⁹⁴ See Article 12 of the NER300 Decision.

⁹⁵ See NER300 FAQ, questions 61 and 170.

⁹⁶ See Article 11(6) of the NER300 Decision.

6 CAPTURE OF CO₂

6.1 Introduction

A combined EOR and CCS project involves the collection of CO₂ from capture installations which may be located in Denmark or in another EU Member State.

The capture of CO₂ can be achieved either by a dedicated installation receiving CO₂ by transfer from other installations, or by the same installation engaging in the activities producing the CO₂ by the combustion of fossil fuels from energy production, i.e. electricity or heat, or industrial production, for instance, refining of mineral oil and the production and processing of ferrous as well as non-ferrous metals, where combustion units with a total rated thermal input exceeding 20 MW are operated.

From 2013 onwards, the ETS Directive applies to installations which engage in the capture of CO₂ from installations encompassed by the ETS Directive for the purpose of the transportation and storage on a storage site permitted under the CCS Directive.

An emissions permit is, therefore, required for the CO₂ capture activity, and the operator of the capture installation must monitor and report emissions and, at the end of the year, surrender allowances equal to the total emissions from the installation that year, as described in section 6.2.

The CO₂ capture installation must also obtain an environmental permit and comply with other environmental and regulatory requirements which apply to the installation's energy production, industrial production and the capture activity itself, as further described in sections 6.3 and 6.4.

6.2 Application of the ETS Directive to CO₂ capture activities

Under the EU ETS, the operator of the CO₂ capture installation must monitor and report emissions from the installation and surrender for cancellation a number of allowances equal to the total emissions from that installation during a calendar year.⁹⁷

There are no free allowances allocated to the CO₂ capture activity or the power sector under the EU ETS.⁹⁸ There is, however, a transitional system for allocation of free allowances to other sectors based on harmonised benchmarks, including free allowances to certain heat-producing installations and industrial installations.⁹⁹

Additionally, the capture installation has no obligation to surrender allowances in respect of emissions "*verified as captured and transported for permanent storage to a facility which has a permit under the CCS Directive*".¹⁰⁰

Any amount of CO₂, which is not emitted from the installation, but is transferred out of the installation to another capture installation or a transport network for the purpose of transport and long-term geological storage, or to a storage site permitted under the CCS Directive, can be subtracted from the installation's emissions. Therefore, the amount of CO₂ emissions transferred out of the installation is the amount that can be subtracted from the emissions of the capture installation.¹⁰¹

⁹⁷ See section 4 of this report.

⁹⁸ See Article 10a(3) of the ETS Directive and recital 19 of the preamble of the Amendment Directive.

⁹⁹ Installations may under certain conditions receive free allowances for district heating and cooling produced through high-efficiency cogeneration as defined by Directive 2004/8/EC on the promotion of co-generation, see Article 10a(4) of the ETS Directive.

¹⁰⁰ See Article 12(3a) of the ETS Directive.

¹⁰¹ See section 4.4 of this report and Article 49 of the Monitoring and Reporting Regulation.

When calculating the total emissions from the CO₂ capture installation, emissions from all parts of the installation related to CO₂ capture, intermediate storage as well as transfer to a CO₂ transport network, must be taken into account. The boundaries of the CO₂ capture installation, and, thereby, the scope of the monitoring and reporting obligations, end at the boundaries of the CO₂ transport pipeline, i.e. including all ancillary functionally connected plant.¹⁰²

Provided that ship transportation is opted into the EU ETS, in accordance with article 24 of the ETS Directive, and monitoring and reporting rules similar to those applicable to pipeline transportation apply, the boundaries of the CO₂ capture installation with respect to monitoring and reporting obligations would, most likely, end at the boundaries of the ship.¹⁰³

The operator of a CO₂ capture activity must at least include the following potential sources of CO₂ emissions: CO₂ transferred to the capture installation as well as combustion and other associated activities at the installation that are related to the capture activity, including fuel and input material use.

Generally, the capture of CO₂ can be achieved by use of pre-combustion¹⁰⁴, post-combustion¹⁰⁵ or oxy-firing¹⁰⁶ technology. There are, however, also installations with industrial processes that emit CO₂ without combustion and where the capture of CO₂ can be achieved. Depending on which technologies and processes are used, the values in respect of the calculation of the CO₂ capture installation's emissions can be determined using different methodologies in the Monitoring and Reporting Regulation.

Furthermore, where the capture installation carries out other activities also covered by the ETS Directive, for instance, energy production or industrial production, the emissions from such activities must also be calculated using other methodologies in the Monitoring and Reporting Regulation.¹⁰⁷

6.3 Environmental Permits and Assessments

Within the European Union certain installations with a high pollution potential are subject to environmental requirements with the aim of ensuring a high level of environmental protection.

Energy-producing installations and industrial installations listed in Annex I of the IPPC Directive¹⁰⁸ must obtain an environmental permit.¹⁰⁹

An installation for the capture of CO₂ from installations encompassed by the Directive for the purpose of geological storage under the CCS Directive is also subject to this requirement.¹¹⁰ A separate environmen-

¹⁰² The boundaries for the pipeline are laid down in the transport network's emissions permit and include all ancillary plant functionally connected to the transport network, including booster stations and heaters, see section 7.2 of this report.

¹⁰³ The boundaries of the ship would in such event most likely also include intermediate compressor stations, intermediate storage facilities, liquefaction facilities as well as onloading facilities, see section 8.2 of this report.

¹⁰⁴ Pre-combustion provides capture of CO₂ by partial combustion (gasification) of CO₂ to produce hydrogen and CO₂.

¹⁰⁵ Post-combustion provides capture of CO₂ by removal of the CO₂ after combustion of the fossil fuel.


¹⁰⁶ Oxy-firing provides capture of CO₂ by burning fuel in pure oxygen instead of atmospheric air.

¹⁰⁷ The total emissions of the capture installation must take into account the emissions from the installation's other activities, for instance, energy production (combustion) or industrial production (processes), as well as any additional combustion or process emissions due to performance of the capture activity itself, see Annex IV, section 21.A of the Monitoring and Reporting Regulation.

¹⁰⁸ The European Parliament and the Council's Directive no. 2008/1/EC of 15 January 2008 concerning integrated pollution prevention and control with subsequent amendments. The IPPC Directive will be replaced by Directive 2010/75/EU on industrial emissions effective from 7 January 2014.

¹⁰⁹ The IPPC Directive has been implemented in Denmark in the consolidated act no. 879 of 26 January 2010 on Environmental Protection with subsequent amendments (Miljøbeskyttelsesloven).

¹¹⁰ Executive Order no. 706 of 24 June 2011 regarding amendments of the permit executive order.



tal permit is required for each of the activities, i.e. the energy or the industrial production activity, as well as the capture activity, being carried out at the capture installation.

The environmental permit must be obtained by the competent authority prior to the construction or operation of the installation.¹¹¹ Any subsequent significant changes in the construction or the operation of the installation which lead to added pollution are also subject to prior approval.

The permit can only be issued if certain conditions, as specified in the IPPC Directive, are met, including technical specifications, the use of all appropriate pollution prevention measures, namely the best available techniques ("BAT"), and other measures for the prevention of pollution.

An installation for the capture of CO₂ is also required to prepare an EIA in accordance with the Environmental Impact Assessment Directive (the "EIA Directive").¹¹² The EIA is subject to public hearing and must enable the competent authority¹¹³ to assess the effects of a project on the environment taking into account the protection of human health and the environment.

An EIA is required for installations for the capture of CO₂ streams for the purposes of geological storage pursuant to the CCS Directive from installations listed in Annex I of the EIA Directive, or where the total yearly capture of CO₂ is 1,5 megatonnes or more.¹¹⁴

An EIA is also required for a pipeline installation having a diameter of more than 800 mm and a length of more than 40 km for the transport of CO₂ streams for the purposes of geological storage, including associated booster stations, as well as for a storage site pursuant to the CCS-Directive.¹¹⁵

Where a combined EOR and CCS project involves installations which are located onshore as well as offshore and in different countries, the EIA requirements for the individual steps in the project chain are covered by different rules and jurisdictions and involve different competent authorities.¹¹⁶

In Denmark, the local municipality is, as a starting point, the competent authority in respect of an EIA for a CO₂ capture installation¹¹⁷, whereas the Danish Energy Agency is the competent authority in respect of an EIA for an offshore pipeline and storage site. Therefore, a coordination and consultation between the competent authorities would be required in respect of the EIA, see section 7.4 of this report.

¹¹¹ In Denmark, the Environmental Protection Agency is the competent authority in respect of a capture installation.

¹¹² The Council's Directive no. 1985/337/EC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment with subsequent amendments. The EIA Directive has been implemented in Danish law in several acts and executive orders.

¹¹³ In Denmark, the EIA competent authority is, as a general rule, local municipality where the installation is to be located. However, the Nature Agency is the competent authority, if a project has significant environmental impact on other countries or other countries request information regarding the project. The Environmental Protection Agency is the competent authorities in other cases, see section 10 and 11, respectively, in the EIA executive order no. 1510/2010

¹¹⁴ See Annex I, no. 23, of the EIA Directive and Annex I, no. 23, of executive order no. 1510 of 15 December 2010 regarding EIA [...] with subsequent amendments. The competent authority decides on a case-by-case basis if installations for the capture of CO₂ that do not meet the said conditions are required to prepare a EIA, see section 3(2) of the EIA executive order no. 1510/2010.

¹¹⁵ See Annex I, nos. 16(b) and 22, respectively, of the EIA Directive and 16(b) and 22, respectively, of the EIA executive Order 1510/2010.

¹¹⁶ Where the pipeline and the storage are located offshore, the rules regarding the EIA must comply with other rules, and the EIA must be submitted to the Danish Energy Agency, see executive order no. 632 of 11 June 2012 regarding EIA for offshore infrastructure projects, see section 7.4 and 9.4 of this report.

¹¹⁷ See footnote no. 121 of this report.

6.4 Other regulatory permits and requirements

Where the CO₂ capture installation is also an energy producing installation for the production of electricity or heating, the installation must also comply with the regulatory requirements of the Danish Electricity Supply Act¹¹⁸ and the Danish Heat Supply Act.¹¹⁹

The Danish Electricity Supply Act requires electricity producing installations above 25MW to obtain a permit from the Danish Energy Agency for the construction and operation of the installation. Any significant changes to the installation, for instance, changes in the equipment for the monitoring of emissions or in the purification technology used, are subject to prior approval by the Agency.¹²⁰ Any changes in an electricity installation due to instalment of a capture facility may, therefore, require prior approval from the Agency under the Electricity Supply Act.

Applicants for a permit for construction of a new electricity installation with a rated electrical output of 300 MW or more must inform the Danish Energy Agency whether suitable storage sites are available for storage of CO₂ from the installation, whether transport facilities from the installation to the storage site are technically and economically feasible, and whether it is technically and economically feasible to retrofit the installation for CO₂ capture.¹²¹ If the Agency finds that the conditions for installing capture equipment at the new installation are met, the permit will be made conditional upon the applicant ensuring suitable space at or by the installation for CO₂ capture equipment.

The consumer prices for electricity are, as a general rule, subject to market prices, whereas the consumer prices for heat must be self-sustaining and can only include necessary costs for production of the heat.

A heat installation cannot add the cost of purchasing an emission allowance under the EU ETS to heat price rates, unless all the free allowances granted to the heat installation have been used for its CO₂ emissions.¹²² If the heat installation has free allowances in excess of its emissions, the value of such allowances must be transferred to the heat consumers.¹²³ The value of any excess free allowances as a consequence of the CO₂ being captured must, therefore, be transferred to the heat consumers.

Following the principles for price setting in the Heat Supply Act, it can be argued that part of the costs for instalment of the capture facility at the installation should be added to the heat price rates as a necessary cost for the production of heat and as a consequence of the financial savings in relation to emission allowances.

7 TRANSPORTATION OF CO₂ BY PIPELINE

7.1 Introduction

In a combined offshore EOR and CCS project, the CO₂ captured at an onshore installation must be transported by a pipeline to the offshore storage site.¹²⁴

¹¹⁸ Consolidated act no. 279 of 21 March 2012 on Electricity Supply with subsequent amendments (Elforsyningsloven).

¹¹⁹ Consolidated act no. 1184 of 14 December 2011 on Heat Supply with subsequent amendments (Varmeforsyningsloven).

¹²⁰ See section 11 of the Electricity Supply Act and Executive Order no. 493 of 12 June 2003 on conditions and procedures for granting approval of new electricity production installations and significant changes in existing installations with subsequent amendments.

¹²¹ See Article 9a of Directive 2001/80/EC and Executive Order no. 648 of 18 June 2010 regarding amendment of executive order no 493/2003, see footnote no. 128 of this report.

¹²² See section 20(8) of the Heat Supply Act

¹²³ See section 20(9) of the Heat Supply Act.

¹²⁴ Transportation of CO₂ by ship is discussed in section 8 of this report.

From 2013 onwards, the ETS Directive includes transport networks consisting of pipelines, including associated booster stations, for the transportation of CO₂ to a storage site permitted under the CCS Directive.¹²⁵

An emissions permit is, therefore, required for the transportation of CO₂ by pipeline, and the operator of the pipeline installation must monitor and report emissions and, at the end of the year, surrender allowances equal to the total emissions from the installation that year. There are certain challenges regarding jurisdiction where the pipeline is located in more than one Member State, as described in section 7.2

The London Protocol and OSPAR Convention will, most likely, be interpreted as not prohibiting the use and export of CO₂ for a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR.¹²⁶ Therefore, the transboundary transportation of CO₂ by pipelines to be used for EOR and storage would not be prohibited for the Contracting Parties to the London Protocol and the OSPAR Convention.

The operator of the pipeline for transportation of CO₂ must provide third party access to the pipeline, the framework of which is governed by the CCS Directive, see section 7.3.

Additionally, permits are required for the construction and operation of the pipeline installation. There are also challenges regarding proper jurisdiction over a transboundary pipeline, as described in section 7.4.

7.2 Application of the ETS Directive to transportation of CO₂ by pipeline

Under the EU ETS, there are no free allowances allocated to transportation of CO₂ by pipeline.¹²⁷

Additionally, under the EU ETS, there is no obligation to surrender allowances in respect of CO₂ emissions “*verified as captured and transported for permanent storage to a facility which has a permit under the CCS Directive*”.¹²⁸

Under Article 49 of the Monitoring and Reporting Regulation, the operator can subtract from the emissions of the installation any amount of CO₂ originating from the capture, transport and storage of CO₂ under the CCS Directive, which is not emitted from the installation, but is transferred out of the installation to any of either (i) a capture installation, (ii) a transport network or (iii) a storage site permitted under the CCS Directive.

The captured CO₂ emissions that the pipeline installation receives from the capture installation and which are transported to the storage site, are not added to the pipeline installation’s calculated level of emissions.¹²⁹ The CO₂ emissions that have been transferred to the pipeline installation and transported to the storage site, therefore, do not affect the pipeline installations’ total emissions, unless there are leakages from the pipeline installations.

The boundaries for the monitoring and reporting obligations are laid down in the transport network’s emissions permit, though it follows from the Monitoring and Reporting Regulation that the boundaries include “*all ancillary plant functionally connected to the transport network, including booster stations and*

¹²⁵ Transport networks are defined in Article 3, no. 22, of the CCS Directive.

¹²⁶ See section 9.3 of this report.

¹²⁷ See Article 10a(3) of the ETS Directive and recital 19 of the preamble of the Amendment Directive.

¹²⁸ See Article 12(3a) of the ETS Directive.

¹²⁹ This applies to pipeline installations that use calculation method B. The installations that use calculation method A must calculate the overall mass balance of all input and output streams, including CO₂ transferred in and out of the installation, see below.

heaters".¹³⁰ Therefore, the pipeline installation also includes seals, measurement devices, valves, intermediate compressor stations and intermediate storage facilities.¹³¹

Furthermore, each transport network shall have a minimum of one start point and one end point, each connected to other installations carrying out one or more of the activities: capture, transport or geological storage of CO₂.¹³²

The operator of the pipeline installation must consider, as a minimum, the following potential emission sources for CO₂ emissions:

- combustion and other processes at installations functionally connected to the transport network including booster stations;
- fugitive emissions¹³³ from the transport network;
- vented emissions¹³⁴ from the transport network; and
- emissions from leakage incidents in the transport network.

When calculating the CO₂ emissions from the pipeline installation, there are two possible calculation methods (a) Method A (overall mass balance of all input and output streams)¹³⁵, or (b) Method B (monitoring of emission sources individually).¹³⁶

The detailed rules for the calculations can be found in the Monitoring and Reporting Regulation.

Where the CO₂ transportation pipeline is located in more than one Member State, each Member State, in principle, has jurisdiction over any part of a pipeline installation that is located on its territory. In that event, the transboundary pipeline can be divided into separate transport networks under the jurisdiction of each of the Member States in which it is located, and must obtain an emissions permit and surrender allowances in accordance with the rules of each Member State.¹³⁷

This gives rise to challenges regarding proper jurisdiction over the pipeline. In respect of jurisdiction for surrender of allowances in the event of leakages from there, four options have been discussed in legal publications:¹³⁸

- The state on whose territory or Exclusive Economic Zone¹³⁹ the leakage occurs

¹³⁰ Annex VI, point 22, section A (scope) of the Monitoring and Reporting Regulation. Start and end points as well as the installations they are connecting to, shall be specified in the greenhouse gas emissions permit.

¹³¹ This follows from Annex VI, point 22, section B.2.1 (fugitive emissions from the transport network) of the Monitoring and Reporting Regulation.

¹³² Annex VI, point 22, section A (Scope) of the Monitoring and Reporting Regulation.

¹³³ "Fugitive emissions" mean any irregular or unintended emissions from sources which are not localised, or too diverse or too small to be monitored individually, see Article 3, no. 48, of the Monitoring and Reporting Regulation.

¹³⁴ "Vented emissions" mean emissions deliberately released from the installation by provision of a defined point of emission, see Article 3, no. 53, of the Monitoring and Reporting Regulation

¹³⁵ This entails calculation of the emissions from the transport network's own activity and adding (or subtracting, if applicable) the amount of CO₂ transferred in (or out, if applicable) of the pipeline. Emissions from fuel used in booster stations are also included.

¹³⁶ This entails calculation of the fugitive as well as the vented emissions from the transport network (including emissions from seals, valves, intermediate compressor stations and intermediate storage facilities), CO₂ leakages (CO₂ emitted as the result of the failure of one or more components of the network) and CO₂ emitted from combustion or other processes functionally connected to the pipeline transport.

¹³⁷ As mentioned in footnote no. 58 of this report, the CCS Directive applies to CCS in the territory of the Member States, their exclusive economic zones and on their continental shelves within the meaning of UNCLOS, see section 7.4 of this report.

¹³⁸ See CATO2 publication regarding Transboundary legal issues in CCS of 2 December 2011 by Tom Mikunda et. al.

¹³⁹ See section 7.4 of this report for a definition of the Exclusive Economic Zone.

- The state in which the pipeline owner resides
- The state in which the CO₂ was captured
- The state in which the CO₂ will be stored

There are no guidelines or practices with respect to the proper jurisdiction, including application of the EU ETS as implemented in the Member States, over transboundary pipelines for the transportation of CO₂.

It follows from the CCS Directive, that in cases of transboundary transport of CO₂, the competent authorities of the Member States concerned should jointly meet the requirements of the CCS Directive and other relevant Community legislation.¹⁴⁰ Therefore, the Member States are expected to find coordinated solutions to avoid multiple compliance with emissions permit requirements and other relevant requirements.

7.3 Third party access to CO₂ transportation pipelines

Under the CCS Directive, the Member States must ensure that potential users are able to obtain access to transport networks. The access should be provided in a transparent and non-discriminatory manner applying the objectives of fair and open access.¹⁴¹

Further, the operator of the transportation network may refuse access due to lack of capacity or lack of connection and must give duly substantiated reasons for the refusal. Where access is refused, the operator must make any necessary enhancements, to the extent that it is economical to do so, or when a potential customer is willing to pay for them, provided this would not negatively impact on the environmental security of the transportation and geological storage of CO₂.¹⁴²

However, the detailed regulation of third party access is left to the Member States to determine. This may lead to the application of different regimes for third party access in Member States. This gives rise to challenges relating to proper jurisdiction over the pipeline in transboundary pipeline projects, as described above under section 7.2.

The CCS Directive merely states that in the event of cross-border disputes for access to a transport network, the dispute settlement provisions that apply are those of the Member State having jurisdiction over the transport network to which access has been refused.¹⁴³

Under the Danish Subsoil Act, third parties have a right of access to CO₂ transport networks, upon payment for such access, and the operator of the transport network must prepare and publish the prices and the terms for access to the network.¹⁴⁴

Where access is granted, the parties will initiate negotiations of the terms and conditions for the use of the transport network. The negotiations must be completed within 4 months or such other time frame agreed by the parties. If the negotiations are not completed within the time frame, either party is entitled to bring the matter before the Danish Energy Agency, requesting a decision regarding use of the transport network.¹⁴⁵

¹⁴⁰ See Article 22 of the CCS Directive.

¹⁴¹ See Articles 21(2)(c) and 21(1)(d) of the CCS Directive.

¹⁴² See Articles 21(3) and 21(4) of the CCS Directive

¹⁴³ See Article 22(2) of the CCS Directive. Where several Member States cover the transport network, the Member States concerned must consult with a view to ensuring that the CCS Directive is applied consistently.

¹⁴⁴ See section 23t(2) of the Danish Subsoil Act. For a discussion on a refusal to grant third party access on the grounds of the efficiency of the combined EOR and CCS project, see section 9.6 of this report.

¹⁴⁵ The decision of the Danish Energy Agency can be appealed to the Energy Board of Appeal and can be finally determined by a court.

7.4 Permitting and other regulatory requirements for the construction and operation of a pipeline

The construction and operation of pipeline facilities for transporting and storing CO₂ in Denmark requires a licence from the Danish Energy Agency.¹⁴⁶ The Agency may specify conditions regarding routing, dimensions, ownership and payment for use in the licence.¹⁴⁷

Where the transportation of CO₂ to the storage site is made through a transboundary pipeline, the question arises which Member State has jurisdiction over the pipeline? Generally, the applicable law is that of the Member State where the pipeline is located.

The United Nations Convention on the Law of the Seas (UNCLOS)¹⁴⁸ defines the different maritime zones applicable and stipulates which law applies in these zones:

- The Territorial Sea which extends up to 12 nautical miles off the coast: the law of the coastal State applies.¹⁴⁹
- The Continental Shelf which extends up to 200 nautical miles off the coast: the law of the coastal state applies. A state has the right to construct and regulate pipelines on the continental shelf transporting the natural resources to shore.¹⁵⁰
- The Exclusive Economic Zone (EEZ) which extends up to 200 nautical miles off the coast: the law of the coastal state applies. A state has the right to construct, operate and use installations and structures in the EEZ.¹⁵¹
- The High Seas which is the area beyond the EEZ and the Continental Shelf. There is freedom to lay pipelines in this area.¹⁵²

Where the pipeline for transportation of CO₂ is located in more than one state's maritime zones, more than one state's law will, in principle, apply. In such event, the different states could agree to coordinate the different compliance requirements in the states.

There is also a requirement under the EIA Directive and Danish law to carry out an EIA prior to the construction of a pipeline offshore¹⁵³ having a diameter of more than 800 mm and a length of more than 40 km for the transport of CO₂ streams for storage to the storage site.¹⁵⁴ The EIA must be submitted to the Danish Energy Agency for approval.¹⁵⁵

¹⁴⁶ See section 23u of the Danish Subsoil Act. The Act applies in the EEZ and the Continental Shelf.

¹⁴⁷ The permit may also specify applicable obligations and requirements, in the case of abandonment.

¹⁴⁸ The United Nations Convention on the Law of the Seas of 10 December 1982.

¹⁴⁹ See Article 2 of UNCLOS.

¹⁵⁰ See Article 79 of UNCLOS. It is questionable whether such pipelines include pipelines for transportation of CO₂. However, Denmark exercises functional jurisdiction over such pipelines, pursuant to the Danish Subsoil Act section 23u.


¹⁵¹ See Article 56 of UNCLOS. In the North Sea area, the EEZ and the continental shelf overlap.

¹⁵² See Article 112 of UNCLOS.

¹⁵³ I.e. in the Danish Territorial Sea, the EEZ and the Continental Shelf. We have not assessed whether the Convention on Environmental Impact Assessment in a Transboundary Context, the so-called ESPOO Convention, applies to transboundary pipelines for transportation of CO₂ for use for EOR and storage activities.

¹⁵⁴ See Annex I, no. 16(b) of the EIA Directive and section 4 of the executive order no. 632 of 11 June 2012 regarding EIA for offshore infrastructure projects.

¹⁵⁵ An EIA is also required for onshore pipelines having a diameter of more than 800 mm and a length of more than 40 km for the transport of CO₂ streams for storage, including associated booster stations, see Annex I, nos. 16(b) and 22, respectively, of the EIA Directive and 16(b) and 22, respectively, of Executive Order no. 1510/2010.



Where the pipeline infrastructure project is likely to have a significant effect on the environment in another EU Member State, the Member State where the project is intended to be performed must submit a description of the project, together with any available information on its possible transboundary impact, to the affected Member State.¹⁵⁶ The affected Member State should then within a reasonable time determine whether it wishes to participate in the environmental decision making procedures.

Under the EIA Directive, the Member States concerned must enter into consultation with each other regarding the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects.¹⁵⁷

Similarly, in Denmark, the Danish Energy Agency must consult with the Danish Environmental Protection Agency and the Danish Nature Agency regarding any EIA for an offshore pipeline for the transportation of CO₂.¹⁵⁸

8 TRANSPORTATION OF CO₂ BY SHIP

8.1 Introduction

An offshore combined EOR and CCS project could possibly involve the transportation of captured CO₂ by ship from the onshore capture installation to the offshore storage site.¹⁵⁹

Transportation of CO₂ by ship is not currently encompassed by the EU ETS. However, a Member State may unilaterally apply to the European Commission for approval of transportation of CO₂ by ship being encompassed by the EU ETS in that Member State, under Article 24 of the ETS Directive through an opt-in procedure, as further described in section 8.2.

CO₂ can be viewed as a potentially hazardous substance, particularly in relation to international conventions, as further described below in section 8.3, and the issue has been raised if CO₂ should indeed be considered a hazardous waste.¹⁶⁰

The view taken in the EU is that waste regulations should not apply to CO₂ used for CCS, as the protection of the environment and human health from the risks posed by geological storage of CO₂ is ensured via the CCS Directive.¹⁶¹

Thus, CO₂ captured and transported for the purposes of geological storage and geologically stored in accordance with the CCS Directive is excluded from the scope of the now repealed 2006 Waste Framework Directive¹⁶², and shipments of CO₂ for the purposes of geological storage in accordance with the CCS

¹⁵⁶ See Article 7 of the EIA Directive and section 8 of the Executive Order no. 632/2012.

¹⁵⁷ See Article 7(4) of the EIA Directive

¹⁵⁸ With respect to environmental liability for pipelines for transportation of CO₂, the EL Directive does not address such pipelines and only specifically states that a CO₂ storage site is an encompassed activity, see further section 9.4 of this report.

¹⁵⁹ Transportation of CO₂ by pipeline is addressed in section 7 of this report.

¹⁶⁰ Particularly in relation to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention). This convention has been implemented in the EU through Regulation 2006/1013 of the European Parliament and of the Council of 14 June 2006 on shipments of waste with subsequent amendments (the Regulation on Shipments of Waste). In 2005, the IPCC expressed the view that there was no indication that CO₂ will be defined as a hazardous substance under the Basel Convention, except in relation to the presence of impurities. However, this has not been clarified by the contracting parties.

¹⁶¹ See recital 46 of the preamble to the CCS Directive.

¹⁶² The European Parliament and the Council's Directive no. 2006/12/EC of 5 April 2006 on waste with subsequent amendments. The 2008 Waste Framework Directive, the European Parliament and of the Council's Directive no. 2008/98/EC of 19 November 2008 on waste and repealing certain Directives, does not seem to contain a similar exclusion.

Directive are excluded from the scope of the Regulation on Shipments of Waste. Therefore, shipment of CO₂ may take place under EU law.

Furthermore, the London Protocol and OSPAR Convention will, most likely, be interpreted as not prohibiting the use and export of CO₂ for a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR.¹⁶³ Therefore, the transboundary transportation of CO₂ by ship to be used for EOR and storage would not be prohibited for the Contracting Parties to the London Protocol and the OSPAR Convention.

8.2 Application of the ETS Directive to transportation of CO₂ by ship

A ship transporting CO₂ for storage in a storage site permitted under the CCS Directive is currently not encompassed by the ETS Directive, and is, therefore, not subject to the requirement of an emissions permit or a requirement to surrender allowances for its emissions.

If a combined EOR and CCS project involves transportation of CO₂ by ship, the ship transportation activity must be opted into the EU ETS pursuant to Article 24 of the ETS Directive.¹⁶⁴

Under article 24 of the ETS Directive, the so-called opt-in article, Member States may apply for the Commission's approval to unilaterally include activities and greenhouse gases which are not listed in Annex I under the scheme in that Member State.¹⁶⁵ Therefore, it is possible for Member States to decide to include ship transport of CO₂ for storage in a storage site permitted under the CCS Directive under the scheme. If these activities are included in the scheme, the activities will require the acquisition of emission permits as well as, possibly, allowances to cover the emissions from the activities.

When applying to include such activities in the scheme, the Member States must take into account all relevant criteria, in particular the effects on the internal market by the inclusion, potential distortions of competition, the environmental integrity of the Community scheme and the reliability of the planned monitoring and reporting system.

When the inclusion of additional activities and gases is approved, the Commission may at the same time authorise the issue of additional allowances and may authorise other Member States to include such additional activities and gases. Furthermore, the Commission may, at its own initiative, and must at the request of a Member State, adopt rules for monitoring and reporting the transportation of CO₂ by ship, if the emissions from such activity can be monitored and reported with sufficient accuracy.¹⁶⁶

The potential inclusion of ship transportation under the EU ETS gives rise to several implications in determining the scope of application of the EU ETS and the content of monitoring and reporting rules.

Where a Member State, with the Commission's approval, includes ship transportation in the EU ETS, it is questionable whether this inclusion would be binding on other Member States where the ship transports CO₂ to or from another Member State or where the ship sails under the flag of another Member State.

¹⁶³ See section 9.3 of this report.

¹⁶⁴ See sections 4.2 and 5.2 of this report and NER300 FAQ, question no. 266.

¹⁶⁵ The approval of the Commission must be in accordance with the regulatory procedures in Article 23. The process of obtaining the Commission's approval usually takes around 6-10 months.

¹⁶⁶ Guidelines for monitoring and reporting requirements, including emission sources, for the transportation of CO₂ by ship may be found in the API's Compendium from August 2009 of greenhouse gas emissions methodologies for the oil and natural gas industry, section 2.2.5, as well as the IPCC Guidelines from 2006 for National Greenhouse Gas Inventories, Volume 2 regarding Energy, Chapter 5 regarding Carbon Dioxide Transport, Injection and Geological Storage.

With respect to the monitoring and reporting requirements, pipeline installations include “*all ancillary plant functionally connected to the transport network, including booster stations and heaters*”.¹⁶⁷ Therefore, the pipeline installation also encompasses seals, measurement devices, valves, intermediate compressor stations and intermediate storage facilities.¹⁶⁸

If the monitoring and reporting principles applicable to pipelines are applied where ship transportation is included in the EU ETS, it is questionable whether any ancillary plants functionally connected to the ship would be encompassed by the boundaries of the monitoring and reporting obligations with respect to the ship. If that is the case, the ship would also include intermediate compressor stations, intermediate storage facilities, liquefaction facilities as well as onloading facilities.¹⁶⁹

The emissions from the pipeline installation itself are included in the calculation of the total emissions of the pipeline installations. If the same principles are applied, where ship transportation is included in the EU ETS, any emissions from the ship itself while transporting the CO₂ to the storage site would also be added to the ship’s total emissions.¹⁷⁰

However, the details of the monitoring and reporting obligations applicable with respect to the transportation of CO₂ by ship remain to be determined.

Article 24a of the ETS directive further stipulates that implementing measures may be adopted, providing for the issue of allowances for projects that reduce greenhouse gas emissions, but which are not encompassed by the ETS.¹⁷¹ The regulatory procedure provides for a committee to assist the Commission composed of representatives of the Member States and chaired by a representative of the Commission.

Measures may only be adopted pursuant to Article 24a to the extent that inclusion is not possible pursuant to Article 24.¹⁷² The details of Article 24a are unclear, and implementation measures are not known to have been adopted yet.¹⁷³

8.3 Shipment of hazardous substances

Our scope of investigation has been limited, so as not to include transportation laws in respect of the transportation of CO₂ by ship. Nevertheless, we include brief comments on various conventions and codes authored by the International Maritime Organization (IMO), which stipulate international standards for the transportation of dangerous goods.

The IMO MARPOL Convention¹⁷⁴ contains regulations on preventing and minimizing pollution from ships - both accidental pollution and that from routine operations. The convention includes a number of annexes,

¹⁶⁷ Annex VI, point 22, section A (scope) of the Monitoring and Reporting Regulation. Start and end points as well as the installations they connect to, shall be laid down in the greenhouse gas emissions permit.

¹⁶⁸ This follows from Annex VI, point 22, section B.2.1 (fugitive emissions from the transport network) of the Monitoring and Reporting Regulation.

¹⁶⁹ On the other hand, a pipeline installation is a stationary installation where such ancillary plants are functionally connected, whereas the ship is a mobile installation without any functional connections as such.

¹⁷⁰ Similarly, any fugitive or vented emissions in relation to the transport itself as well as onloading and offloading of the CO₂ could also be calculated towards the ship’s total emissions.

¹⁷¹ It must be adopted with scrutiny by the Commission according to the procedure set out by Council Decision 1999/468/EC.

¹⁷² Where emissions are encompassed under the EU ETS by measures adopted under art. 24a, such emissions must afterwards be considered by the Commission for inclusion in the next review of the emission trading scheme, see Article 24a(1) of the ETS Directive.

¹⁷³ See Unger, Moritz von and Hoozgaard, Jelmer: “Domestic Offsets under Article 24a”, 2010, pp. 8-10. Available at http://jiactiongroup.com/documents/Article24aEUETSRoundtableBackgroundPaperv1.022Feb10_000.pdf

¹⁷⁴ The International Convention for the Prevention of Pollution from Ships 1973/78, as amended.

of which particularly Annex II on noxious liquid substances in bulk¹⁷⁵ and Annex III on harmful substances in packaged form¹⁷⁶ may be of relevance.¹⁷⁷

The IMO SOLAS Convention¹⁷⁸ contains minimum safety standards for the construction, equipment and operation of ships. Of particular relevance is Annex 1, Chapter VII on the carriage of dangerous goods, which makes mandatory the requirements of the IMO codes described below.

Application of the IMO codes depends on both the quality of the cargo and the mode of transportation.

When transporting CO₂ as a liquefied gas in bulk, the ship must comply with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). The IGC Code applies to gas carriers constructed on or after 1 July 1986. Gas carriers constructed before that date must comply with the requirements of the IGC Code or the Code for Existing Ships Carrying Liquefied Gases in Bulk.

Transportation of dangerous packaged goods must comply with the International Maritime Dangerous Goods Code (IMDG) Code. The IMDG code contains comprehensive provisions on the classification of dangerous goods, as well as concerning, for instance, packing, stowage and segregation.

Another code, which may be relevant, is the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code).¹⁷⁹

9 INJECTION AND STORAGE OF CO₂

9.1 Introduction

In a combined EOR and CCS project, the captured CO₂ will be transported by pipeline or ship to an off-shore oil and gas facility. The CO₂ will be injected into a closed system in which the CO₂ can circulate for the purpose of EOR whilst permanent storage of the CO₂ occurs.

From 2013 onwards, the ETS Directive includes storage of CO₂ in a storage site permitted under the EU Directive on the geological storage of carbon dioxide (the CCS Directive).¹⁸⁰ In a combined EOR and CCS project, the CO₂ emissions from EOR activities are calculated towards the total CO₂ emissions from the storage site, as further described in section 9.2.

The London Protocol and OSPAR Convention were amended in 2006 as well as 2009, and 2007, respectively, to allow the use and export of CO₂ for sequestration, but are silent as to the use of CO₂ for EOR. They are, most likely, to be interpreted as not prohibiting the use and export of CO₂ for a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR. This is discussed further in section 9.3.

¹⁷⁵ Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk.

¹⁷⁶ Annex III: Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form.

¹⁷⁷ We have not assessed whether these annexes apply to liquefied CO₂. In Denmark, the MARPOL Convention has been implemented through The Danish Act on the Protection of the Marine Environment and executive orders under the provisions of this Act.

¹⁷⁸ The International Convention for the Safety of Life at Sea, 1974, as amended.

¹⁷⁹ We have not assessed whether this code applies to transportation of liquefied CO₂ by ship.

¹⁸⁰ The European Parliament and the Council's Directive 2009/31/EC of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, [...].

The CCS Directive stipulates the legal framework for the environmentally safe storage of CO₂ in the Member States whereby the CO₂ is permanently contained.¹⁸¹ The containment of the CO₂ should take place 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.¹⁸²

EOR is not in itself included in the scope of the CCS Directive, however, the Directive applies where EOR is combined with geological storage of CO₂.¹⁸³

Under the CCS Directive, storage of CO₂ requires an exploration permit as well as a storage permit, and financial security must be put in place to encompass all obligations arising under the storage permit. The operator of a storage site is required to monitor the site and to immediately notify the competent authority in the event of leakages of CO₂, see section 9.5.

Furthermore, the operator must provide third parties access to the storage site, as described in section 9.6.

9.2 Application of the ETS Directive to EOR and storage of CO₂

It follows from the ETS Directive that there is no free allocation of allowances for storage of CO₂. Furthermore, there is no obligation to surrender allowances in respect of emissions verified as captured and transported for permanent storage to a facility which has a permit under the CCS Directive.¹⁸⁴

The Monitoring and Reporting Regulation specifies the emission sources and methodologies for monitoring emissions from a storage site. In the calculation of the storage installation's CO₂ emissions, the operator must not add CO₂ received from another installation, i.e. the pipeline or the ship where this is included in the EU ETS¹⁸⁵, to its calculated level of emissions, and must not subtract from its calculated level of emissions any CO₂ which is geologically stored in the storage site.¹⁸⁶ Thereby, the CO₂ captured, transported and stored in the storage site will not be calculated towards the storage site's emissions.

The boundaries for monitoring and reporting emissions from a storage site will be based on the delimitation of the storage site¹⁸⁷ and storage complex¹⁸⁸, as specified in the storage permit.¹⁸⁹

The potential emission sources for CO₂ from a storage site that an operator of the site must monitor are¹⁹⁰:

- fuel use by associated booster stations and other combustion activities including on-site power plants;
- vented and fugitive emissions from injection;
- vented and fugitive emissions from enhanced hydrocarbon recovery operations¹⁹¹; and

¹⁸¹ In Denmark, the CCS Directive has been implemented in the Danish Subsoil Act, which is described in this section.

¹⁸² See Article 1(2) of the CCS Directive.

¹⁸³ See recital 20 of the preamble of the CCS Directive where it is also stated that Enhanced Hydrocarbon Recovery in the Directive refers to the recovery of hydrocarbons in addition to those extracted by water injection or other means.

¹⁸⁴ See Article 12(3a) of the ETS Directive.

¹⁸⁵ See section 4.2 and 8.2 of this report regarding the inclusion of ship transport of CO₂ in the EU ETS.

¹⁸⁶ See Annex IV, section 23.B (quantification of CO₂ emissions) of the Monitoring and Reporting Regulation.

¹⁸⁷ Storage site is defined in footnote no. 4 of this report.

¹⁸⁸ Storage complex is defined in footnote 40 of this report.

¹⁸⁹ The installation boundaries should be set as broad as possible and so as to include certain associated activities, primarily combustion units. See section 2.3.2 of the Commission's Guidance on Interpretation of Annex I of the EU ETS Directive of 18 March 2010.

¹⁹⁰ Annex IV, section 23.A (scope) of the Monitoring and Reporting Regulation.

- leakages¹⁹².

Therefore, in a combined EOR and CCS project, the said emissions from EOR activities are calculated towards the total CO₂ emissions from the storage site.

The EOR and CCS activities are carried out in relation to an oil and gas facility. The combustion of fuel at such facility is in itself encompassed under the ETS Directive, provided that the combustion units of the installation have a total rated thermal input exceeding 20 MW. The same emissions permit would then cover all the facility's combustion as well as the CCS and related EOR activities under the ETS Directive.¹⁹³ Monitoring and reporting requirements for these activities would be specified in the emissions permit.

In relation to an oil and gas facility not in itself encompassed under the ETS Directive, i.e. where the combustion units of the installation do not have a total rated thermal input exceeding 20 MW, all emissions from combustion units used for EOR and CCS activities must nevertheless be taken into account when calculating the total CO₂ emissions from the storage installation, since activities directly related to the storage activity must be included.

The operator of a storage site is subject to monitoring and reporting requirements under the CCS Directive as well as the ETS Directive and the Monitoring and Reporting Regulation. It may be beneficial for a harmonised community wide approach if there were guidelines or standards for monitoring and reporting activities to ensure compliance with both the CCS and ETS requirements.¹⁹⁴

9.3 The "dumping" of CO₂ in the seabed by injection and storage

Denmark is a Contracting Party to the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Protocol) and the 1992 Convention on the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). The Protocol and the Convention deal with dumping of wastes into the seabed.

Under the London Protocol Contracting Parties are obliged to prohibit dumping of any wastes and other matter which are not listed in Annex 1 of the Protocol.¹⁹⁵ Annex 1 was amended in 2006 to allow dumping by sequestration of CO₂ streams from CO₂ capture processes.¹⁹⁶

Furthermore, Contracting Parties must not allow the export of wastes and other matter to other countries for the purpose of dumping them at sea.¹⁹⁷ In 2009, this provision was amended to allow for export of CO₂ streams for disposal in accordance with Annex 1 of the London Protocol. The 2009 amendment has not yet entered into force.

The London Protocol and the 2006 and 2009 amendments permitting the use and export of CO₂ for sequestration, do not address the use of CO₂ for EOR. However, the use of CO₂ for EOR is most likely not

¹⁹¹ These emissions from EOR include, for instance, emissions from the oil-gas separation units and gas recycling plant, the flare stack or the CO₂ purge system, as specified in Annex IV, section 23.B.2 (vented and fugitive emissions from enhanced hydrocarbon recovery operations) of the Monitoring and Reporting Regulation.

¹⁹² "Leakages" means any release of CO₂ from the storage complex, see Article 3, no. 5, of the CCS Directive.

¹⁹³ An emissions permit may cover one or more installations on the same site operated by the same operator, see Article 6(1) of the ETS Directive.

¹⁹⁴ See the Commission's Guidance Document 2 to the CCS Directive on Characterisation etc, page 92.

¹⁹⁵ See Article 4 of the London Protocol.

¹⁹⁶ The amendment was implemented into the Danish Subsoil Act by act no. 541 of 30 May 2011.

¹⁹⁷ The exporting country is directly obliged under the Protocol not to permit export for dumping, see Article 6.

encompassed by the Protocol's definition of dumping, as it is encompassed by the exemptions to this definition.¹⁹⁸

The exemptions include disposals related to the normal operation of platforms or other manmade structures at sea, placement of matter for a purpose other than the mere disposal thereof, and disposal and storage of waste and other matter related to seabed mineral resource activity.¹⁹⁹ It is generally accepted that seabed mineral resource activity includes oil and gas exploration and exploitation activities.²⁰⁰

Furthermore, the issue of the date of entry into force of the 2009 amendment allowing export of CO₂ for sequestration is, therefore, only relevant if the CO₂ injection is for storage and not for EOR. In this respect, the purpose of the injection will be of decisive importance.

It is fair to argue that even if a considerable part of the injected CO₂ actually is permanently stored, it can still be regarded as EOR, provided the injection and storage is carried out as part of oil exploitation activities.

In a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR, the London Protocol will most likely be interpreted as not prohibiting the use and export of CO₂, as the use of CO₂ for EOR is most likely covered by the exemptions in the Protocol. This is also the view taken by the IMO²⁰¹, the Danish Nature Agency²⁰² and the International Energy Agency²⁰³.

The OSPAR Convention in Annex III prohibits any dumping of wastes or other matter from offshore installations. However, discharges and emissions from offshore sources are excluded from the prohibition, but are subject to authorisation and regulation by the competent authorities.²⁰⁴

Annex III was amended in 2007 to allow storage of CO₂ streams from CO₂ capture processes.²⁰⁵ The exception only covers storage, where the CO₂ is intended to be retained permanently in a sub-soil geological formation. The amendment entered into force on 23 July 2011 for Norway, Germany, United Kingdom, Spain, European Union, Luxembourg and Denmark²⁰⁶, and on 28 October 2011 for the Netherlands.²⁰⁷

¹⁹⁸ This view was also taken by the CM Legal and Related Issues Working Group on CO₂ Sequestration which is included in the Report of the 27th Consultative Meeting, convened from 24 to 28 October 2005. The working group is established under the IMO. The views of the Group included in the Report are based on the results of a questionnaire regarding CCS answered by the countries participating in the London Protocol.

¹⁹⁹ See Articles 1.4.2.1, 1.4.2.2 and 1.4.3 of the London Protocol

²⁰⁰ This view was also taken by the CM Legal and Related Issues Working Group on CO₂ Sequestration, see footnote no. 198 of this report.

²⁰¹ See the IMO's Report from 2008 of the 1st Meeting of the Legal and Technical Working Group on Transboundary CO₂ Sequestration Issues (LP/CO₂ 1/8), at paragraph 2.4.

²⁰² See the Danish Nature Agency's memorandum of 12 April 2011 on the London Protocol and use of exported CO₂ for combined EOR and CCS.

²⁰³ See the International Energy Agency's working paper of October 2011 on Carbon Capture and Storage and the London Protocol – Options for Enabling Transboundary CO₂ Transfer, on page 9.

²⁰⁴ The Report by the Group of Jurists and Linguists from 2004 on Placement of carbon dioxide in the OSPAR Maritime Area states that no activity is intended to be regulated by more than one of the three regimes, see paragraphs 6 and 7 of the Report.

²⁰⁵ The amendment will enter into force for those Contracting Parties, which have ratified it, when at least seven Contracting parties have ratified the amendment.

²⁰⁶ The amendment was implemented into the Danish Subsoil Act by act no. 541 of 30 May 2011.

²⁰⁷ See OSPAR Commission press release of 28 October 2011 regarding the ratification of OSPAR carbon capture and storage measures.

The OSPAR Convention and the 2007 amendment only allows the use of CO₂ for storage, but is silent as to the use of CO₂ for EOR, whether or not such use occurs simultaneously with the permanent storage of CO₂.

The view taken in a report by the Group of Jurists and Linguists is that use of CO₂ for EOR is not prohibited by the Convention, as the CO₂ emissions arising from normal operation of an offshore installation are examples of excluded emissions under Annex III.²⁰⁸ The report further states that where CO₂ is injected in a genuine attempt to facilitate or improve the production of hydrocarbons, it should be treated on the same basis as any other substance used for production purposes, regardless of the source of the CO₂.

Therefore, the most likely interpretation is that the OSPAR Convention does not prohibit the injection of CO₂ for a combined EOR and CCS project, and does not prohibit export of CO₂ to be used for such a project.

9.4 Regulatory requirements for EOR and CO₂ storage

Under the CCS Directive, the EU Member States have the right to determine the areas where storage sites may be selected and, therefore, may decide whether or not they will allow CCS.²⁰⁹

This includes the right of Member States not to allow any storage, in part or on the whole of their territory, or to give priority to any other use of the underground, such as exploration, production and storage of hydrocarbons or geothermal use of aquifers.²¹⁰

Denmark has provided a framework for allowing storage of CO₂ in the Danish subsoil by implementing the CCS Directive in the Danish Subsoil Act and will grant storage permits on a case-to-case basis in accordance with the provisions of the act.

Currently, there is no storage of CO₂ in Denmark, and an application for permission to use the onshore subsoil for storage of CO₂ has been rejected, as the government awaits reports on international experiences with CCS.²¹¹ However, the Danish politicians are generally positive towards combined EOR and CO₂ storage offshore.²¹²

It follows from the CCS Directive and the Danish Subsoil Act that an exploration permit is required before any exploration can be carried out, where exploration is required to generate the information necessary for selection of a storage site.²¹³ "Exploration" is defined in the CCS Directive as the assessment of potential storage complexes for the purpose of storage of CO₂ by means of activities intruding into the subsurface, such as drilling to obtain geological information about strata in the potential storage complex and, as appropriate, performing injection tests in order to characterise the storage site.²¹⁴

²⁰⁸ The Group of Jurists and Linguistics is a group under the OSPAR Commission which provides advice on OSPAR draft decisions and recommendations. The excluded emissions are specified in Article 3, paragraph 2 of Annex III of the OSPAR Convention.

²⁰⁹ If they intend to allow storage of CO₂, the Member States must assess storage capacity available in their territory, See Articles 4(4) and 5(4) of the CCS Directive.

²¹⁰ See recital 19 of the preamble of the CCS Directive.

²¹¹ See letter of October 2011 from the Ministry of Climate, Energy and Building to the Parliament Committee.

²¹² See the report of the Energy-political committee of 12 May 2011 to the proposal no. 141 for act no. 541 of 30 May 2011.

²¹³ See Article 5(1) of the CCS Directive. In Denmark, an exploration permit is granted by the Danish Energy Agency based on applications submitted under a licensing round procedure or a so-called open door procedure.

²¹⁴ See Article 3, no. 8, of the CCS Directive.

It is, however, not specified in the Directive or the Act whether, in a combined EOR and CCS project, the exploration of the oil reservoirs for the purpose of EOR and storage can be carried out solely under an existing exploration permit for hydrocarbons under the Danish Subsoil Act.²¹⁵

A geological formation²¹⁶ can 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.²¹⁷ The Commission has issued a Guidance Document regarding the characterisation of the storage complex and the CO₂ stream.²¹⁸

The holder of an exploration permit has an exclusive right to explore the potential CO₂ storage complex. Furthermore, when granting storage permits, holders of an exploration permit are given priority over other applicants for storage permits over the potential storage complex encompassed by the exploration permit.²¹⁹

A storage permit is required for any storage²²⁰ of CO₂ in underground geological formations.²²¹ The storage permit will specify the requirements imposed in relation to operation and closure of the storage site, for instance, the precise location and delimitation of the storage site and storage complex, and the volumes of CO₂ authorised to be stored.

The storage permit will also state the requirements as to composition of the CO₂ streams.²²² The Danish Subsoil Act requires that a CO₂ stream must consist primarily of carbon dioxide, and that no waste or other matter may be added for the purpose of disposing of that waste or other matter.²²³

Where CO₂ is injected into the Danish offshore subsoil for the use of combined EOR and storage, an approval of the hydrocarbon production plan as well as a storage permit are required.²²⁴

²¹⁵ It can be argued that an exploration permit for storage is not required where the exploration activities for the storage of CO₂ are carried out as an integrated part of the exploration activities for EOR, provided that the assessment and characterisation of the storage site under the CCS Directive can be based on these exploration activities. However, the CCS Directive applies to a combined EOR and CCS project and an exploration permit for hydrocarbons only entails exploration and work commitments relating to hydrocarbons. Additionally, only the holder of an exploration permit for storage is given priority over other applicants for a storage permit covering the same area as the exploration permit.

²¹⁶ "Geological formation" means a lithostratigraphical subdivision within which distinct rock layers can be found and mapped, see Article 3, no. 4, of the CCS Directive.

²¹⁷ See Article 4(4) of the CCS Directive and section 23f.2 of the Danish Subsoil Act.

²¹⁸ See the Commission's Guidance Document 2 to the CCS Directive on Characterisation of the storage complex, CO₂ stream, Composition, Monitoring and Corrective Measures. The Guidance Document is not binding on the Member States.

²¹⁹ In Denmark, holders of licences for exploration and exploitation of hydrocarbons in a potential storage complex area do not have priority for exploration or storage permits, see the Danish Energy Agency's hearing memorandum of 10 January 2011.

²²⁰ "Geological storage of CO₂" means injection accompanied by storage of CO₂ streams in underground geological formations, see Article 3, no. 1, of the CCS Directive.

²²¹ See Article 6 of the CCS Directive and section 23 of the Danish Subsoil Act. All applications for storage permits should be available to the Commission, and all draft storage permits must be transmitted to the Commission to enable it to issue an opinion on the draft permits within four months of their receipt, see Article 10 of the CCS Directive.

²²² See Article 9 of the CCS Directive. As part of granting the storage permit, the competent authority will also approve a monitoring plan, a corrective measures plan and a provisional closure plan, see Articles 15-17 of the Directive.

²²³ See section 23g of the Danish Subsoil Act. The operator must establish and maintain a register of the volumes of CO₂ delivered and injected as well as the properties and composition of the CO₂ stream.

²²⁴ Where the CO₂ is injected in the Danish subsoil only for the use for EOR, i.e. without storage of the CO₂, any changes related thereto in an approved hydrocarbon production plan for the oil and gas facility where the EOR is carried out, must only be approved by the Danish Energy Agency under section 10 of the Danish Subsoil Act.

Additionally, the Danish Subsoil Act specifies that in case of injection of CO₂ streams, the CO₂ is deemed to have been stored immediately following injection.²²⁵ This also applies to a combined project in which CO₂ is injected, produced and reinjected as part of the EOR process, provided the process takes place in a closed loop.²²⁶

There is also a requirement under the EIA Directive and Danish law to carry out an EIA for the storage site.²²⁷ The EIA must be submitted to the Danish Energy Agency.²²⁸

The holder of a storage permit must meet monitoring and reporting requirements set out in the CCS Directive. The monitoring should be carried out, for instance, to enable detection of leakage or migration of CO₂ from the storage site. The results of the monitoring should be reported to the competent authority with the frequency specified in the storage permit, and as a minimum, once a year.²²⁹

Additionally, the permit holder must put in place financial security covering all the obligations arising under the permit.²³⁰ These obligations include closure and post closure requirements, any obligations arising from inclusion of the storage site under the ETS Directive as well as the EL Directive.

Under the EL Directive, the operator of a storage site permitted under the CCS Directive must prevent and remedy any and all environmental damage caused by the storage site activity and is strictly liable for such damage.²³¹ The principle in the EL Directive is that the polluter pays for the environmental damage.

The EL Directive deals only with environmental damage, and does not cover any civil liability caused by the storage site activities, for instance, damage to property, economic loss or personal injury.

The financial security can be in the form of a parent company guarantee, an insurance²³², a bank guarantee, or any other equivalent financial security that the competent authority acting reasonably finds adequately covers the storage permit holder's obligations.²³³ The Commission has issued a Guidance Docu-

²²⁵ It follows from recital 20 of the preamble to the CCS Directive that where EOR is combined with geological storage of CO₂, the Directive's provisions for the environmentally safe storage of CO₂ should apply. The Danish Minister of Climate and Energy has stated that a combined EOR and CCS project under the Danish Subsoil Act is characterised by the storage of more CO₂ than what is necessary for the EOR activity. It can be inferred from the Minister's answer that injection of CO₂ purely for oil extraction purposes is not viewed as a storage activity. However, it most likely cannot be inferred from the answer that a project in which all of the injected CO₂ is used for EOR cannot be viewed as a combined project, provided that the project adheres to the legal requirements of both EOR and CCS. Consequently, such a combined project can be included in the EU ETS and will require both an approval of the hydrocarbon production plan as well as a storage permit. See the Minister of Climate and Energy's answer to question no. 26 of 6 May 2011 in relation to the proposal for amendment of the Danish Subsoil Act (j.nr. 2001-1435).

²²⁶ See section 23h of the Danish Subsoil Act and the preparatory work for this provision. The CCS Directive does not specify when the CO₂ streams are deemed to be stored.

²²⁷ See Annex I, no. 22 of the EIA Directive and section 4 of the executive order no. 632 of 11 June 2012 regarding EIA for offshore infrastructure projects.

²²⁸ In July 2012, the Danish Energy Agency prepared a Strategic Environmental Assessment of an area in the Danish part of the North Sea in connection with the upcoming licensing round in 2013 for the exploration and production of hydrocarbons, and licensing of permits for injection of CO₂ in existing oil fields for the purpose of EOR.

²²⁹ See Articles 13 and 14 of the CCS Directive.

²³⁰ See Article 19 of the CCS Directive.

²³¹ Environmental damage is any damage to protected species and habitats, damage to water and damage to soil. Damage is defined as a measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly, see Articles 2(1) and 2(2) of the EL Directive.

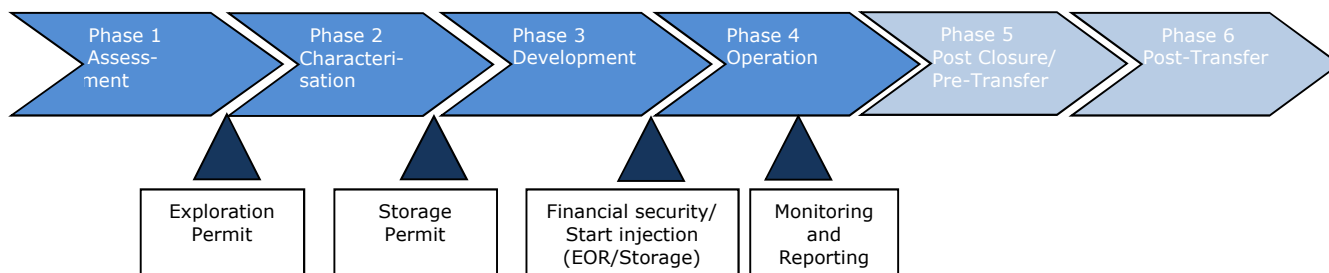
²³² A Member State may act as insurer, and in that manner bear part of the responsibility, see preparatory works to section 23q of the Danish subsoil Act.

²³³ In Denmark, see section 14.1 of the Executive Order 859/2011 on the geological storage of CO₂ etc..

ment²³⁴ specifying the different types of financial security envisaged²³⁵, the obligations that the financial security covers, and the implications of providing and maintaining the financial security.

The required financial security must be valid and effective before commencement of the injection of CO₂. As a general rule, it must remain valid and effective until the responsibility for the storage site has been transferred to the competent authority.²³⁶

Figure 9.4²³⁷: Illustration of the phases, permits and activities for the storage of CO₂



9.5 Assessment of the risk of and liability for CO₂ leakages from the storage site

The CCS Directive aims at ensuring an integrated risk assessment for CO₂ leakage, including the site selection requirement designed to minimise the risk of leakage, monitoring and reporting requirements to verify storage and adequate remediation of any damage that might occur.²³⁸ Leakage is defined as any release of CO₂ from the storage complex.²³⁹

Risk assessment in the context of the CCS Directive means the identification, assessment, and prioritisation of risks to secure storage, together with the application of resources to prevent, monitor and correct leakages or significant irregularities throughout the project life cycle.²⁴⁰

The operator of a storage site must monitor the storage complex, including the injection facilities, where possible the CO₂ plume and, where appropriate, the surrounding environment, for instance to detect significant irregularities, migration or leakage of CO₂.

The operator is required to immediately notify the competent authority in the event of leakages or significant irregularities²⁴¹, and to take the necessary corrective measures, as laid down in the corrective

²³⁴ See the Commission's Guidance Document 4 to the CCS Directive on Article 19 Financial Security and Article 20 Financial Mechanism.

²³⁵ This includes, for instance, deposits, irrevocable trust funds, escrow accounts, bonds issued by surety companies or banks and irrevocable standby letter of credit.

²³⁶ The security must be periodically adjusted to take account of changes to the assessed risk of leakage and the estimated costs of all obligations arising under the permit, see Articles 19(2) and 19(3) of the CCS Directive.

²³⁷ This figure is based on 'Figure 1: Summary of CO₂ Storage Life Cycle Phases and Milestones' in the Commission's Guidance Document 1 to the CCS Directive on CO₂ Storage Life Cycle Risk Management Framework.

²³⁸ See recital 7 of the preamble of the CCS Directive.

²³⁹ See section 23e, no. 11, of the Danish Subsoil Act.

²⁴⁰ See the Commission's Guidance Document 1 to the CCS Directive on CO₂ Storage Life Cycle Risk Management Framework, page 4. Risk assessment and management tools in relation to CCS projects can be found in DNV Report No. 2009-1425 titled "CO₂QUALSTORE - Guideline for Selection and Qualification of Sites and Projects for Geological Storage of CO₂".

²⁴¹ "Significant irregularity" is defined as any irregularity in the injection or storage operations or in the condition of the storage complex itself, which implies the risk of a leakage or risk to the environment or human health, see section 23e, no. 13, of the Danish Subsoil Act.

measures plan. Corrective measures are defined as any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of CO₂ from the storage complex.²⁴²

In Denmark holders of permits under the Danish Subsoil Act are strictly liable to pay damages for any loss, damage or injury caused by the activities carried out in accordance with the permit, even though the loss, damage or injury was accidentally caused.²⁴³

The rules in the CCS Directive and the Danish Subsoil Act do not address the question of liability for leakage of CO₂, or other loss, damage or injury, where several storage permit holders use the same storage site under third party access rules. An agreement between the operator of the storage site and the users regarding such liability would need to be considered.

9.6 Third party access to the CO₂ transport network and the storage site

Under the CCS Directive, the Member States must ensure that potential users are able to obtain access to storage sites in a transparent and non-discriminatory manner, applying the objectives of fair and open access.²⁴⁴ However, the detailed regulation of third party access is left up to the Member States.

Under the Danish Subsoil Act a third party has a right of access to CO₂ storage sites, upon payment for such right of access, and the operator of the site must prepare and publish the prices and the terms for access thereto.²⁴⁵ Additionally, third parties have a right of access to installations for the production, processing and transport of hydrocarbons, subject to payment for such access.²⁴⁶

The operator of the storage site may refuse access on the grounds of lack of capacity or lack of connection and must give duly substantiated reasons for the refusal. Where access is refused on the grounds of lack of capacity or a lack of connection, the operator must make any necessary enhancements, as far as it is economically viable to do so, or where a potential customer is willing to pay for them, provided this would not negatively impact on the environmental security of the storage of CO₂.²⁴⁷

The provisions in the CCS Directive and the Danish Subsoil Act regarding third party access do not address the question of whether an operator can refuse a request for third party access based on the grounds that third party access to the storage site will affect the efficiency of a planned combined EOR and CO₂ storage.²⁴⁸

The CCS Directive, however, states that the Member States shall apply the objectives of fair and open access taking into account, for instance, the need to respect the duly substantiated reasonable needs of the owner or operator of the storage site, or of the transport network and the interests of all other users of the storage or the network or relevant processing or handling facilities who may be affected.²⁴⁹

²⁴² See Article 3, no. 19, of the CCS Directive. The competent authority may require the operator to undertake the necessary corrective measures. Further, the competent authority may at any time take the necessary corrective measures, also in the event the operator fails to do so. The costs are recoverable against the operator, including by drawing on the financial security placed by the operator, where the competent authority has to undertake the corrective measures on the operator's behalf.

²⁴³ The general liability principles apply, i.e. there is a requirement of causation etc. It is not specified in the Act whether it is possible to agree with the competent authority on a limitation of liability.

²⁴⁴ See Articles 21(2)(c) and 21(1)(d) of the CCS Directive.


²⁴⁵ See section 23t(2) of the Danish Subsoil Act. The procedural rules regarding requests for access, the Danish Energy Agency's competence in case of disputes etc, are the same as for third party access to pipelines, see section 7.3 of this report.

²⁴⁶ See section 16 of the Danish Subsoil Act and the Third Party Access Executive Order 1132/2011.

²⁴⁷ See section 23t(4) of the Danish Subsoil Act.

²⁴⁸ The Danish Energy Agency stated in its hearing memorandum of 10 January 2011 that this question will be addressed in a future executive order regarding third party access.

²⁴⁹ See Articles 21(2)(c) and 21(1)(d) of the CCS Directive.



Therefore, it is most likely that an operator can refuse a request for third party access based on the grounds of lack of capacity, in that third party access to the storage site will affect the efficiency of a planned combined EOR and CO₂ storage.

10 CLOSURE OF STORAGE SITE AND TRANSFER OF RESPONSIBILITY

10.1 Introduction

The closure of a CO₂ storage site entails the definitive cessation of CO₂ injection into that storage site. Closure of a storage site can only take place, if such closure has been approved by the competent authority.

After the storage site has been closed upon approval of the competent authority, the operator remains responsible for certain obligations and liabilities under the CCS Directive, the ETS Directive and the EL Directive, as further described in section 10.2.

Transfer of the responsibility of the storage site to the competent authority is conditional upon all available evidence indicating that the stored CO₂ will be completely and permanently contained and that a minimum of 20 years after the closure of the storage site has elapsed, see section 10.3.

Furthermore, the operator must make a financial contribution available to the competent authority to cover post transfer obligations, as described in section 10.4.

10.2 The closure of the storage site and the post-closure plan

A storage site shall be closed if the relevant conditions stated in the permit have been met, following an application from the storage permit holder, or at the substantiated request of the operator, after authorisation of the competent authority.²⁵⁰

Closure of a storage site can, in any case, only take place if it has been approved by the competent authority.

An application for closure of the storage site may be made on the basis that the operator deems that a safe limit of injection has been reached, even if the permit allows more injection, or if continued injection becomes uneconomic.²⁵¹

Closure involves cessation of injection, plugging and abandoning of selected wells, equipment removal, and on-site inspection.²⁵² Further, a final post-closure plan must be prepared and approved by the Danish Energy Agency.²⁵³

²⁵⁰ See Article 17(1) of the CCS Directive. The competent authority may also decide to close a storage site after the withdrawal of a storage permit.

²⁵¹ Therefore, the operator can in principle request approval of the closure of the storage site at any time, provided the request is substantiated.

²⁵² See the Commission's Guidance Document 1 to the CCS Directive on the CO₂ storage life cycle etc., page 14.

²⁵³ The plan must be based on best practice and comply with the requirements laid down in Annex 2 of the CCS Directive, see Article 17(3) of the Directive.

After a storage site has been closed, the operator remains responsible for monitoring, reporting and corrective measures. Furthermore, the operator is responsible for the obligations relating to the surrender of allowances in case of leakages, pursuant to the ETS Directive and preventive and remedial action under the EL Directive until the responsibility for the storage site is transferred to the competent authority.²⁵⁴

10.3 Transfer of the responsibility for the storage site to the competent authority

Where a storage site has been closed, the responsibility for certain obligations relating to the storage site must be transferred to the competent authority, in Denmark the Danish Energy Agency, at its own initiative or upon request from the operator.²⁵⁵

Under the CCS Directive the transferred responsibility consists of all legal obligations relating to monitoring and corrective measures under the CCS Directive, the surrender of allowances in the event of leakages pursuant to the ETS Directive and preventive and remedial action pursuant to the EL Directive.²⁵⁶

However, the Danish Subsoil Act states that all legal obligations regarding the storage site are transferred to the Danish Energy Agency. As opposed to the CCS Directive, the Danish act entails that all legal obligations without any limitation or specification of the transferred obligations.

Transfer of the responsibility is conditional upon the following four conditions being met:²⁵⁷

- all available evidence indicates that the stored CO₂ will be completely and permanently contained,
- as a main rule a period of 20 years, or a shorter or longer period of time to be determined by the competent authority, after the closure of the storage site has elapsed,
- the required financial contribution has been put in place,²⁵⁸ and
- the site has been sealed and the injection facilities have been removed.²⁵⁹

The transfer of responsibility may take place prior to the post closure period of 20 years having passed, if the operator of the storage site can substantiate and the competent authority is convinced that the stored CO₂ has been completely and permanently contained before the end of the 20-year period.

The operator must prepare a report documenting that the conditions for closure of the storage site have been met and submit it to the competent authority, so that it can approve the transfer of responsibility.²⁶⁰ The Commission has issued a Guidance Document regarding the criteria for transferring responsibility of the storage site to the competent authority.²⁶¹

²⁵⁴ See Article 17(2) of the CCS Directive.

²⁵⁵ See Article 18(1) of the CCS Directive.

²⁵⁶ Conversely, other legal obligations and liabilities, including civil liability for environmental damage and contractual liabilities, remain with the operator.

²⁵⁷ See Article 18(2) of the CCS Directive. The conditions appear to be cumulative conditions which must be met.

²⁵⁸ See Article 20 of the CCS Directive and section 10.4 of the executive order 859/2011 on geological storage.

²⁵⁹ This also involves removal of the monitoring facilities and surface areas. The competent authority can require that certain monitoring facilities remain to enable monitoring after the transfer, see the Commission's Guidance Document 3 to the CCS Directive on the Criteria for Transferring Responsibility to Member States, page 15.

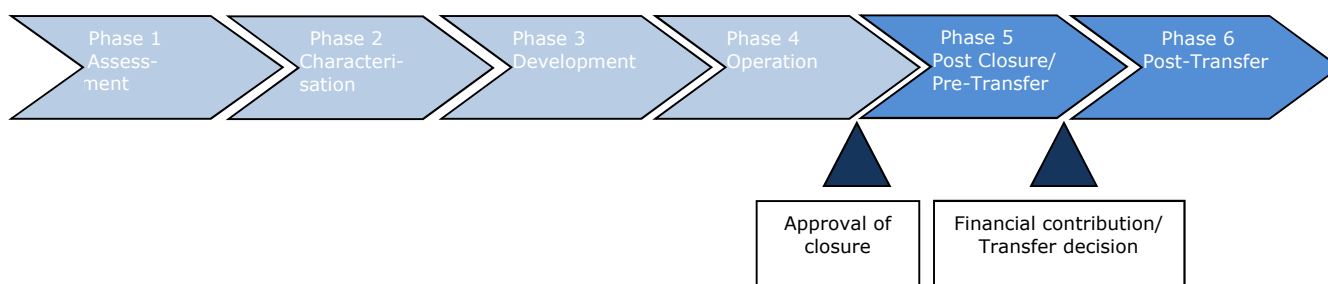
²⁶⁰ See Article 18(3) of the CCS Directive.

²⁶¹ See the Commission's Guidance Document 3 to the CCS Directive on the Criteria for Transferring Responsibility to Member States.

The competent authority will provide a decision of approval of the transfer of responsibility, specifying the method for determining that the conditions for closure have been met, as well as any updated obligations for the sealing of the storage site and for the removal of injection facilities.²⁶²

The CCS Directive does not specify that the data related to the storage site should be transferred to the competent authority.²⁶³ However, the Commission expects that the operator will transfer to the competent authorities all of the relevant documents and raw data, including core samples, drill cuts, construction sample materials and other key material samples extracted from the site.²⁶⁴

Figure 10.3²⁶⁵: Illustration of the phases, permits and activities for the closure of a CO₂ storage site



10.4 Establishing a financial contribution to cover post closure obligations

The operator must make a financial contribution available to the competent authority, in Denmark the Danish Energy Agency. This must occur before the transfer of the responsibility of the storage site to the authority can take place.²⁶⁶

The financial contribution can be the same instrument as the financial security put in place when obtaining the storage permit.²⁶⁷ Where separate instruments are used, the financial security cannot be released until the financial contribution has been made.²⁶⁸

The Commission has issued a Guidance Document²⁶⁹ specifying the different types of financial contribution possible, for instance, parent company guarantee, insurance, bank guarantee.²⁷⁰

The contribution must cover at least the anticipated cost of monitoring for a period of 30 years.²⁷¹

²⁶² The competent authority's draft decision for approval must be submitted to the Commission for obtaining its opinion thereon, see Articles 18(4) and 18(5) of the CCS Directive.

²⁶³ It is also not specified whether it would be possible to agree with the competent authority on some of the criteria that constitute a basis upon which a storage operator may insist that liability transfers to the competent authority.

²⁶⁴ See the Commission's Guidance Document 3 to the CCS Directive on the Criteria for Transferring Responsibility to Member States, page 15.

²⁶⁵ This figure is based on 'Figure 1: Summary of CO₂ Storage Life Cycle Phases and Milestones' in the Commission's Guidance Document 1 to the CCS Directive on CO₂ Storage Life Cycle Risk Management Framework.


²⁶⁶ See Article 20 of the CCS Directive.

²⁶⁷ See the Commission's Guidance Document 4 to the CCS Directive on Article 19 Financial Security and Article 20 Financial Contribution, page 41.

²⁶⁸ See Article 19(3)(b)(ii) of the CCS Directive.

²⁶⁹ See the Commission's Guidance Document 4 to the CCS Directive on Article 19 Financial Security and Article 20 Financial Mechanism.

²⁷⁰ Additionally, deposits, irrevocable trust funds, escrow accounts, bonds issued by surety companies or banks, irrevocable standby letter of credit can be used for the financial contribution.



Furthermore, the competent authority may require that the financial contribution also covers the costs borne by the authority after the transfer of responsibility to ensure that the CO₂ is completely and permanently contained in the storage site, including any corrective measures, the surrender of allowances in case of leakages from the storage site and preventive and remedial actions in relation to environmental liability.²⁷²

It is not specified in the CCS Directive or the Danish Subsoil Act in which situations and in what manner the competent authority may draw upon the financial contribution put in place by the operator, though the competent authority may specify this, as well as the time period for validity of the financial contribution, in the storage permit or in connection with approval of closure and the post closure plan.

11 CONCLUSION

This section highlights principal outstanding legal issues identified in this report.

A fundamental legal challenge to the envisaged combined EOR and CCS project is the fact that transportation of CO₂ by ship is not covered by the EU ETS. The incentive for CO₂ capture and storage activities is the exclusion from the requirement to surrender allowances under the EU ETS in respect of the stored CO₂. However, transportation by ship interrupts the CCS chain which the monitoring and reporting requirements are based on. Consequently, CO₂ emissions captured and transported by ship for storage are added to both the capture installation's as well as the storage installation's total CO₂ emissions.

The solution to this challenge seems to be that ship transportation is opted-in under Article 24 of the ETS Directive, as is also assumed in relation to NER300 funding. The details of the monitoring and reporting obligations applicable to such transportation remain to be determined.

Transboundary projects, such as pipelines located in more than one Member State or transboundary storage sites, give rise to various jurisdictional issues. Under the CCS Directive, Member States are expected to find coordinated solutions, but there is no detailed regulation of these issues. It is thus a challenge to ensure the necessary coordination, for instance, regarding requirements under the EU ETS and in relation to environmental impact assessments. Additionally, the detailed regulation of third party access to transportation networks and storage sites is left to the Member States. This may lead to different regimes in the Member States. In this connection, liability issues in case of CO₂ leakages need to be considered.

The London Protocol and the OSPAR Convention have been amended to allow the use and export of CO₂ for CCS, although the amendment to the Protocol allowing export of CO₂ for CCS has not yet entered into force. Further, the Protocol and the Convention will most likely be interpreted as not prohibiting the use and export of CO₂ for a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR. The export prohibition under the London Protocol may, however, still pose a barrier if this condition is not met.

The CCS Directive and the provisions in the Danish Subsoil Act regarding storage of CO₂ apply to a combined EOR and CCS project. However, it is not specified how the rules governing enhanced oil recovery, including existing permits issued thereunder, and the rules governing storage of CO₂ should be applied to encompass both the EOR activity and the storage of CO₂ activity, for instance in relation to exploration permits and third party access to CO₂ storage sites.

²⁷¹ When determining the size of the post transfer obligation, the operator can take into account the criteria referred to in Annex 1 of the CCS Directive and the elements relating to the history of storing CO₂.

²⁷² The establishment of the financial security does not prevent the competent authority from bearing any costs related to the storage site after the transfer of the responsibility thereof, see the preparatory works to section 23r of the Danish Subsoil Act.



Furthermore, several issues remain unsettled in relation to transfer of the responsibility of the storage site to the competent authority, including which legal obligations and data, if any, are transferred, and which situations and in what manner can the competent authority draw upon the financial contribution put in place by the operator.

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