



Strategic Analysis of the Global Status of Carbon Capture and Storage

Report 3: Country Studies
The European Union

Final Report



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1. Executive summary

The European approach to CCS policy and legislation represents some of the most comprehensive proposals for the regulation of commercial CCS facilities in the world. The CCS Directive, in particular, is a significant step towards the widespread deployment of CCS technology. It endeavours to remove regulatory barriers to CCS projects and, in doing so, amends a number of general European legislative instruments.

These amendments, together with the CCS Directive itself, the Revised ETS Directive and M&R Guidelines, provide a developing framework of European law and policy that is intended to facilitate the development of CCS projects across the EU.

Notwithstanding these developments, further legislative and policy measures are needed if the widespread deployment of CCS technology is to progress. The European Commission has been tasked to prepare and adopt guidelines on a number of issues and there is a need to conduct reviews of certain other European legislation to ensure that the capture, transport and storage of CO₂ is consistent with that legislation.

The most important next stage in the development of EU-wide CCS legislation is the transposition of the relevant CCS European directives into the domestic law of Member States. The potential for multi-jurisdictional CCS projects, and the fact that geological storage sites are not spread uniformly across the EU, means that effective and consistent transposition could be an important factor in the success of any European cross-border CCS projects.

2. Glossary

CCS Directive	Directive 2009/31/EC on the geological storage of CO ₂
CCR	Carbon Capture Readiness
Community	The European Community
EERP	European Economic Recovery Plan
Environmental Liability Directive	Council Directive 2004/35/EC of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage.
EUAs	European Union Allowances
EU ETS	EU Emissions Trading Scheme
IPPC	Integrated Pollution Prevention and Control Directive
Large Combustion Plants Directive	Directive 2001/80/EC
M & R Guidelines	Draft monitoring and reporting guidelines for CCS activities approved by the European Climate Change Committee
Member States	Member States of the European Union
NAP	National Allocation Plan
NER	New Entrants' Reserve
Renewable Energy Directive	Directive 2009/28/EC on the promotion of the use of energy from renewable sources
Revised ETS Directive	Directive 2009/29/EC
Waste Framework Directive	Directive 2006/12/EC of 5 April 2006 on waste
ZEP	European Technology Platform for Zero Emission Fossil Fuel Power Plants

3. CO₂ pricing

3.1 Introduction

The key European mechanism that imposes a cost on GHG emissions is the European Union Emissions Trading Scheme (EU ETS), which commenced on 1 January 2005. It provides a mechanism for the allocation and auctioning, trade and surrender of CO₂ allowances, with the twin objectives of internalising the costs of CO₂ emissions and reducing such emissions in the most cost-effective way. A number of significant changes to the EU ETS are forthcoming, and these changes could play an important role in the commercial deployment of CCS technology.

3.2 Mandatory cap and trade schemes

The EU ETS is a pan-European cap and trade scheme and is the largest multi-country, multi-sector GHG emissions trading scheme in the world. The legislative basis for the EU ETS is Directive 2003/87/EC, which has most recently been amended through the adoption of Directive 2009/29/EC (the Revised ETS Directive).

The EU ETS generally covers energy-intensive installations in energy and industrial sectors, such as electricity generation, iron and steel manufacturing and minerals processing.¹ It is divided into distinct phases:

- Phase I — commenced on 1 January 2005 and ran to the end of 2007.
- Phase II — commenced on 1 January 2008 and will run to the end of 2012.
- Phase III — will commence on 1 January 2013 and will run to the end of 2020.

During each phase, operators of installations within the scope of the EU ETS must account for their actual emissions on a yearly basis through the surrender of an equivalent number of “allowances” (EUAs).

For Phases I and II, each Member State was required to submit a National Action Plan (NAP), which sets an overall emissions “cap” for the sectors covered. This cap is converted into a set number of EUAs, which are distributed in accordance with the NAP to individual installations falling within the scope of the EU ETS. For Phase III, the use of Member State NAPs will be replaced by a single EU-wide cap, distributed according to harmonised rules.

After allocation, EU ETS installations must monitor and report their emissions. They may choose to implement abatement technologies and, by doing so, free up EUAs to sell on the carbon market. Alternatively, they may purchase EUAs to cover any excess emissions (i.e. emissions that they cannot cover using their initial allocation). The overall number of EUAs allocated will decrease over time and it is expected that this will result in a corresponding reduction in European CO₂ emissions.² The emissions reduction target for sectors covered by the EU ETS is 21 percent below 2005 levels by 2020.

¹ Notably, it does not yet include emissions from the aviation or shipping industries. On 19 November 2008, however, Directive 2008/101/EC, the Aviation Directive was adopted. It will bring aviation within the scope of the EU ETS from 1 January 2012. The introduction of maritime emissions remains under consideration.

² Operators of covered installations may use a certain percentage of carbon credits originating from the Kyoto Protocol flexible mechanisms for compliance purposes. The use of these credits is, however, beyond the scope of this report.

3.2.1 CO₂ cost pass-through

To date, EUAs have largely been allocated for no charge. Notwithstanding that, power prices have risen across the EU partly because electricity producers have generally tended to pass-through the full opportunity cost of CO₂ allowances to customers.

Free allocation is being gradually phased-out. In Phase III, the general rule is that 100 percent of EUAs will be auctioned in respect of the large electricity power producing sector, with other sectors moving towards full auctioning during Phase III so that by 2027 full auctioning will be the norm for all sectors.³ As such, it can be expected that CO₂ costs will be increasingly passed through over time.

3.2.2 Application of emission reduction obligations

The EU ETS was expanded in Phase II to cover flaring from offshore oil and gas production. The scope of coverage is defined as the combustion of materials derived from the exploration, appraisal, production, storage and processing of offshore oil and gas (including imported oil and gas stored in offshore reservoirs), for purposes other than energy production, where such activities are undertaken at offshore oil and gas facilities or onshore oil and gas reception terminals that are designated combustion installations with a rated thermal input exceeding 20 MW.

In Phase III the EU ETS will be extended further to cover the capture, transport and geological storage of GHGs. Operators of installations that fall within the scope of the EU ETS from 2013 onwards will not need to surrender ETS allowances for CO₂ that is permanently stored or avoided.⁴

3.2.3 CCS-specific incentive provisions

STAGED TECHNICAL GOALS

The Revised ETS Directive does not specifically provide for staged technical goals for CCS facilities in the EU. The EU has, however, adopted policies that set out goals for the deployment of CCS technology. These policies are discussed further in Section 5.

BONUS PERMIT ALLOCATION

The deployment of CCS technology during Phase III of the EU ETS is intended to be incentivised by the exemption of operators of covered installations from the obligation to surrender EUAs in respect of CO₂ emissions that are permanently stored or avoided.

To further incentivise the development of CCS projects, the Revised ETS Directive provides that:

- up to 300 million EUAs in the new entrants' reserve (NER) will be made available until 31 December 2015 to help stimulate the construction and operation of up to 12 demonstration projects,⁵ and

³ Although 100 percent auctioning is the ultimate aim for all sectors, internationally trade exposed industries and industries of strategic importance will continue to receive free EUAs for a number of years.

⁴ See Annex I of the Revised ETS Directive. Note that Member States are already free to include, unilaterally, CCS projects in the ETS pursuant to the current ETS Directive.

⁵ The NER is a set aside of allowances reserved for new installations and extensions to existing covered installations. Note that it is not a resource that has been developed solely for the purposes of promoting CCS technology. Only a proportion of the NER may be used to stimulate the construction and operation of the demonstration projects.

- a portion of the revenue from the auctioning of allowances may be used for promoting CCS projects. Pursuant to the Revised ETS Directive, at least 50 percent of the revenues generated from the auctioning of allowances should be used to reduce GHG emissions in one of a number of ways, including through CCS projects.

Neither the EUAs from the NER nor any auction revenues have yet been set aside for specific projects. In terms of the former, the criteria for selecting the CCS projects that will receive EUAs from the NER are under development at EU-level. In terms of the latter, it will be for individual Member States to determine the use (at their discretion) of revenues generated from the auctioning of allowances.

3.3 Non-mandatory emission reduction schemes

EU climate change policies cover an extensive range of mandatory and voluntary emission reduction initiatives in support of a wide range of low carbon technologies. There are, however, no EU-level voluntary cap and trade schemes.

3.4 CO₂ taxation schemes

There is no integrated policy or legislation implementing a CO₂ taxation scheme in the EU. However, reports suggest that Sweden will call for the EU-wide coordination of CO₂ taxes at national level when it takes over the presidency in July. The Swedish Prime Minister has publicly stated his support for a tax on the emission of CO₂ (Openeurope, 2009).

3.5 Indirect cost imposition: renewable energy schemes

3.5.1 Portfolio energy standards

Directive 2009/28/EC on the promotion of the use of energy from renewable sources (the Renewable Energy Directive) is part of the EU legislation to implement the Climate Change and Energy Package (the raft of measures, which includes the CCS Directive).

The Renewable Energy Directive sets specific targets for each Member State for the share of energy which must come from renewable sources by 2020, with an overall EU target of 20 percent by 2020. In order to achieve its specific target, each Member State is required to promote and encourage energy efficiency and energy saving. Further, 10 percent of each Member State's transport energy consumption must come from renewable sources.

3.5.2 Feed-in tariffs

There are no feed-in tariffs set at the EU-level.

3.6 Greenhouse gas emission and energy use reporting schemes

Two main instruments cover monitoring and reporting obligations in respect of direct GHG emissions:

- the most extensive GHG monitoring and reporting obligations (in terms of volume of GHGs covered) are imposed pursuant to the EU ETS Directive.

- in addition, monitoring and reporting obligations for GHGs not covered by the EU ETS may be imposed by the Integrated Pollution Prevention and Control (IPPC) Directive.⁶

Prior to the EU ETS, GHG emissions were potentially subject to regulation through the imposition of emission limits (and corresponding monitoring and reporting obligations) under the IPPC Directive. The introduction of the EU ETS amended this position to ensure that where GHGs are regulated by the EU ETS, then such emissions should not be subject to specific emission limit values (and corresponding monitoring and reporting requirements) under the IPPC permitting regime.

Note that draft monitoring and reporting guidelines for CCS activities were approved by the European Climate Change Committee (the M&R Guidelines) on 16 March 2009. The M&R Guidelines will amend existing monitoring and reporting guidelines for activities covered by the EU ETS. The European Parliament will now scrutinise the guidelines before they are finalised.

⁶ The Integrated Pollution Prevention and Control permitting regime was originally established by Directive 96/61/EC and was amended on a number of occasions. In 2008, these amendments were codified and consolidated into Directive 2008/1/EC.

4. Existing CCS initiatives

4.1 Introduction

The last two years has seen a rapid development of the framework of European law and policy to facilitate the progress of CCS projects. Directive 2009/31/EC (the CCS Directive) now forms the central legal pillar for the widespread introduction of commercial CCS technology, supported by amendments to other legal instruments that are intended to remove a number of legal barriers to the deployment of CCS technology.

Policy and funding initiatives have also played a central role in fostering public and private support for CCS technology. These include:

- March 2007 - European Spring Council: European leaders agreed key policy goals relating to the development of a number of demonstration projects to demonstrate the commercial viability of CCS technology by 2020, as well as targets for capture readiness in the meantime;
- November 2007 - Strategic Energy Technology Plan: reaffirmed the commitment to develop a CCS framework for Europe.
- May 2009 - European Economic Recovery Plan (EERP): which will establish a program to aid economic recovery and will include funding for certain CCS projects.

Notwithstanding these legislative and policy developments, the pan-European deployment of commercial CCS facilities remains some way off. The CCS Directive leaves significant discretion for Member States to resist the development of CCS facilities in their jurisdictions. Both the CCS Directive and the associated amendments to other legal instruments must be transposed into the national laws of Member States. Effective and consistent transposition could be an important factor in the success of any European cross-border CCS projects.

4.2 Acreage releases

The CCS Directive establishes a legal framework for the environmentally safe geological storage of CO₂ in the territory of the Member States, their exclusive economic zones and on their continental shelves (CCS Directive). It does not, however, require Member States to offer up acreage for CCS storage. Member States retain the right to determine suitable areas in their jurisdiction for storage and, ultimately, Member States are entitled to refuse storage in any part or all of their territory (CCS Directive).

4.3 Government or government-business research facilities

The EU does not have a European-funded research facility dedicated to developing CCS technology. It does, however, sponsor the European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP), which is mandated to identify obstacles to the deployment of CCS technology and to provide a strategic research agenda for the Research Directorate General of the European Commission (ZEP, 2009). ZEP was founded in 2005 and has been actively involved in proposals to develop a network of integrated, large scale demonstration projects across Europe.

4.4 Government funding

In addition to EUAs set aside in the NER of the EU ETS, the European Parliament has approved the European Economic Recovery Plan (EERP). The EERP will take the form of a European Regulation, which will establish a program to aid economic recovery by granting €3.98 billion of funding for a series of energy projects across Europe. €1.05 billion has been set aside for up to seven CCS projects from a list of projects that have been pre-selected as being eligible to apply for the funding.

4.4.1 Mapping and data collection and sharing

European funding has been used to support an assessment of the overall European capacity for the geological storage of CO₂.⁷ However, the CCS Directive provides that where Member States intend to allow storage in their territory, they must themselves assess the storage capacity available (CCS Directive).

4.4.2 Research, development and commercialisation

Currently, most CCS activities in the EU remain at the research and development level. There are, however, a number of pilot or early stage CCS projects that are underway. The key projects in place in the EU are outlined below.

The world's first demonstration-scale CCS coal plant is located in the German area of Schwarze Pumpe.⁸ The project is run by Vattenfall and it began operations on 9 September 2008 using the Oxyfule capture method. It is hoped that the project will serve as a prototype for future full-scale power plants. The plant captures 24 tonnes of CO₂ per day.

CO₂SINK Ketzin⁹ is a pilot project to observe the effects of geological storage of CO₂. The project is based in Ketzin, Germany and is funded by the European Commission, the Federal Ministry of Economics and Technologies, the Federal Ministry of Education and Research and industry.

The EU also has a couple of industrial-scale storage projects. Statoil's Sleipner Project¹⁰ in the Norwegian sector of the North Sea captures CO₂ from a natural gas production stream and injects it into the seabed. Sleipner has stored over 1 million tonnes of CO₂ per year since 1996. The Snøhvit Project¹¹, located in the Barents Sea, Norway, similarly captures CO₂ from natural gas and has the capability to store up to 700,000 tonnes of CO₂ per year. (These are discussed further in the Norway country study).

In addition, many existing and proposed plants in the EU have begun to plan to incorporate CCS technology. The ZEP's November 2008 list of announced European CCS demonstration projects listed over 40 projects, most of which are in planning stages.¹²

⁷ The "EU GeoCapacity" project was, for example, co-funded by the EU within the remit of the 6th Framework Program of the European Community for Research, Technological Development (Geocapacity, 2005).

⁸ For more information of this project see http://www.vattenfall.com/www/co2_en/co2_en/879177td/879211pilot/901887test/index.jsp.

⁹ For more information of this project see <http://www.co2sink.org/index.html>.

¹⁰ For more information on the Sleipner project see <http://www.statoil.com/STATOILCOM/SVG00990.nsf?opendatabase&lang=en&artid=F36765A6833828C0C1256FEF003BAB1B> and <http://www.statoil.com/INF/SVG03735.NSF?OpenDatabase&lang=en>.

¹¹ For more information on the Snøhvit project see <http://www.snohvit.com/STATOILCOM/snohvit/svg02699.nsf?OpenDatabase&lang=en>.

¹² The list is available at <http://www.forum-posquiot.org/files/ficheiro/File/CCS-projects.pdf>.

4.5 Liability for failure to capture

There is currently no means of imposing direct liability on operators of installations that fail to capture CO₂ emissions. The CCS Directive does, however, introduce a requirement for certain large combustion plants to be CO₂ capture ready (see Section 6.3.2).

4.6 Evaluation

A key strength of the European policies and legislation is that they are comparatively well developed. That is not to say that the widespread deployment of CCS projects will necessarily go ahead. The adoption of the CCS Directive, amendments to other legislative instruments and the policy framework does, however, provide a robust foundation and an element of certainty for organisations intending to develop commercial CCS facilities.

A potential weakness of European policies and legislation derives from the flexibility of European law, including the discretion of Member States to refuse any storage of CO₂ in their territories (see Section 5.2). Variations in the willingness of each Member State to embrace CCS technology in its jurisdiction is likely to be key. The implementation of the CCS Directive within Member States themselves will affect the timing and overall effectiveness of European policies.

5. Capture of CO₂

5.1 Introduction

The CCS Directive focuses on the geological storage of CO₂. It does not, therefore, aim to regulate every aspect of CO₂ capture. A large volume of regulation currently exists in respect of analogous activities, which means that amendments to the legal instruments governing those activities could be sufficient to regulate the capture and transport of CO₂.

5.2 Integrated policy and legislation

There is no integrated policy or legislation in place to govern the capture of CO₂. Amendments to existing legislative instruments have, instead, been adopted pursuant to the CCS Directive. These are discussed in Section 6.3.

5.3 General policy and legislation with applicability to CO₂ capture

5.3.1 Planning requirements

Directive 85/337/EEC (the Environmental Impact Assessment Directive) requires that an environmental impact assessment be carried out before development consent is granted for certain types of projects which are likely to have significant environmental effects. The CCS Directive amends the Environmental Impact Assessment Directive to include CCS transport pipelines, storage sites and capture installations.

5.3.2 Retrofitting

Directive 2001/80/EC (the Large Combustion Plants Directive) sets limits on emissions of sulphur dioxide, nitrogen oxides and particulate matter from large combustion plants. It applies primarily to power stations and boilers in petroleum refineries and steelworks, as well as other large industrial boilers. The purpose of the Directive is to reduce acidification, dust/fine particles and ground-level ozone.

The CCS Directive amends the Large Combustion Plants Directive by requiring Member States to assess whether - in relation to combustion plants - suitable storage sites are available, transport facilities are technically and economically feasible, and it is technically and economically feasible to retrofit for CO₂ capture. It also introduces into the Large Combustion Plants Directive the requirement of "carbon capture readiness" (CCR) in relation to new-build electricity generating power stations with rated capacity of 300MW or more.

The CCR requirement stipulates that, as a condition of obtaining a construction licence, certain new plants would have to have sufficient space for retrofitting of CCS equipment. There will also be a requirement to carry out an assessment of suitable storage sites and transportation facilities. This will apply to all new applications for certain combustion power stations as well as applications that are currently being considered.

5.3.3 Relevant pollution laws and policies

The IPPC Directive regulates the environmental impact of a wide range of industrial activities. In particular, it regulates emissions to air, water and land through a permitting regime. The CCS Directive amends the IPPC Directive to include within its scope the capture of CO₂ by CCS installations.

Directive 2000/60/EC (the Water Framework Directive) establishes a framework for community action in the field of water policy. It is designed to improve and integrate water management throughout the EU. The Water Framework Directive, *inter alia*, requires the classification of bodies of water. It is amended by the CCS Directive so that Member States can authorise the injection of CO₂ streams into geological formations for storage purposes.

5.4 Taxation of CO₂ capture

There is no European-level taxation of CO₂ capture. Each Member State must consider the application of its domestic taxation scheme to the capture of CO₂.

5.5 Evaluation

Historically, a number of European legislative instruments could have potentially posed regulatory barriers to the introduction of commercial CCS projects. The CCS Directive has, however, amended these with a view to eliminating actual or potential barriers to CCS activities. These amendments, together with the Revised ETS Directive and M&R Guidelines, provide a developing framework of European law and policy that should help to facilitate the development of CCS projects.

Although there seems to be no clear fundamental weaknesses in European policies and legislation governing the capture of CO₂, there are a number of areas which require clarification. In particular, the Commission needs to review certain other European legislation to ensure that the capture, transport and storage of CO₂ is consistent with such legislation.

Examples of the possible need for further changes include the review currently being undertaken to determine whether a CO₂ stream could fall within the scope of the existing Directive on the control of major-accident hazards involving dangerous substances (Directive 96/82/EC, the Seveso II Directive). Classification of CO₂ as a dangerous substance in this way would not prevent the development of CCS projects, but would necessitate amendments to certain other related European legislation. By way of further example, the European Commission has been tasked to prepare and adopt guidelines on a number of issues relating to the CCS Directive, including determining the composition of the CO₂ stream intended for geological storage.

6. Transport of CO₂

6.1 Introduction

The CCS Directive focuses on the geological storage of CO₂. It does not, therefore, aim to regulate every aspect of CO₂ transportation. It does, however, establish a number of important principles relating to the transport of CO₂.

The CCS Directive does not set out the detailed rules for the transport of CO₂, but when combined with amendments to existing legislation (which in most cases were required by the CCS Directive), there should be a reasonably comprehensive regime which, in principle, applies to the industrial transportation of captured CO₂. In practice, the availability or otherwise of certain transport networks to CCS operators may depend on the willingness of Member States to allow CCS operations in their territory.

6.2 Integrated policy and legislation

There is relatively little integrated legislation for the transport of CO₂. The transport of CO₂ will largely be governed by existing legislation (as amended by the CCS Directive) on the basis that there are substantial similarities between CO₂ transport and certain pipeline activities that are already regulated (e.g. natural gas pipelines). The CCS Directive does, however, set out the principles for third party access to transport networks for those seeking to transport CO₂.

6.2.1 Licencing of transportation activities

Because there is no specific integrated CCS regime for the transportation of CO₂, the licencing of transportation activities will be largely regulated by general legislation.

PIPELINES

The CCS Directive creates a regime for third party access to transport networks. Transport Networks are defined as the network of pipelines, including associated booster stations, for the transport of CO₂ to storage sites. The CCS Directive requires Member States to take "necessary measures" to ensure that potential users are able to obtain access to transport networks for the purposes of geological storage in their jurisdiction.

Because the transport of CO₂ may involve multiple jurisdictions, Member States are required to ensure that the various competent authorities appointed to fulfil the provisions of the CCS Directive work together to meet the requirements of the Directive.

Although the CCS Directive lays out broad principles that apply to the grant of third party access rights to transport networks, the detailed rules and modalities of communication remain under development.

6.3 General policy and legislation specific to transport of CO₂

The EU has an established regime covering the transport of substances similar to CO₂. The CCS Directive provides overarching principles relating to the use of existing and potential new transport networks. It does not, however, provide the detailed rules that Member States may need to implement to provide third party access. Taking the principle of subsidiarity into account (as well as the fact that

Member States are not compelled to facilitate CO₂ storage in their territories), the implementation of any such detailed rules that may be required will remain within the competence of individual Member States.

6.3.1 Planning

The transportation of CO₂ will be governed by existing rules that relate to analogous activities. The planning regime that regulates similar activities (e.g. natural gas pipelines) will be relevant to CCS activities. In addition, national policies and legislation will also be relevant.

The CCS Directive seeks to amend existing legislation to the extent that such existing legislation could hinder the development of CCS activities. In this context, the amendment to the Environmental Impact Directive is relevant.

6.3.2 Environmental and other risks

The CCS Directive seeks to amend existing legislation to the extent that such existing legislation could hinder development of CCS activities. In relation to environmental and other risks, the CCS Directive makes three key amendments to existing legislation:

Directive 2006/12/EC of 5 April 2006 on waste (the Waste Framework Directive) establishes the legislative framework for the handling of waste in the EU. It defines key concepts such as "waste", "recovery" and "disposal" and puts in place the essential requirements for the management of waste. These requirements include the obligation for an organisation carrying out waste management operations to have a permit or to be registered and an obligation for the Member States to draw up waste management plans. The CCS Directive amends Directive 2006/12/EC so that CO₂ captured and transported for the purposes of CCS is excluded from the scope of the Waste Framework Directive.

Regulation (EC) No 1013/2006 (the Shipments of Waste Regulation) establishes procedures and control regimes for the shipment of waste. These controls depend on the origin, destination and route of the shipment, the type of waste shipped and the type of treatment to be applied to the waste at its destination. The CCS Directive amends the Shipments of Waste Regulation to exclude from its scope shipments of CO₂ for the purposes of CCS.

Directive 2004/35/EC (the Environmental Liability Directive) seeks to ensure the prevention and remedying of environmental damage. Specifically, it seeks to prevent and remedy damage to habitats and species protected by EU law, and to habitats or species on a site of special scientific interest, damage to water resources, and land contamination which presents a threat to human health. The Environmental Liability Directive reinforces the "polluter pays" principle - making operators financially liable for threats of or actual damage. The CCS Directive amends Directive 2004/35/EC, extending it to cover CCS storage.

6.4 Taxation of CO₂ transport

There is no European-level taxation of CO₂ transport. It is for each Member State to consider the application of its domestic taxation scheme to the transport of captured CO₂.

6.5 Evaluation

Prior to the adoption of the CCS Directive, a number of European legislative instruments may have hindered the commercial deployment of CCS projects. The CCS Directive both establishes important principles for third party access to transport networks and amends legislation that might otherwise compromise CCS development.

Notwithstanding these developments, the CCS Directive does not provide the detailed rules required for the transportation of CO₂. This may be expected, in light of the nature of the EU principle of subsidiarity and the fact that Member States are not compelled to allow CO₂ storage in their territories. The practical consequences of this deference to individual Member States remains to be seen and may depend on the extent to which individual Member States embrace CCS technology.

7. Exploration of potential CO₂ storage sites

7.1 Introduction

Article 5 of the CCS Directive provides general principles relating to the exploration of potential CO₂ sequestration sites. Where Member States determine that exploration is required to assess potential storage sites, they must ensure that any entities undertaking such exploration do so under and in compliance with the appropriate permit. In other words: no exploration permit, no exploration.

7.2 Integrated policy and legislation

7.2.1 Exploration licencing

APPLICATION CRITERIA

The CCS Directive does not set out detailed rules on application criteria, but does require Member States to ensure that: exploration permits are potentially open to all entities possessing the necessary capacities; and the permits are granted or refused on the basis of objective, published and non-discriminatory criteria (CCS Directive).

RIGHTS CONFERRED BY EXPLORATION LICENCE

The CCS Directive states that an exploration permit should be granted in respect of a limited "*volume area*". Subject to that limitation, the holder of an exploration permit should gain the sole right to explore the potential CO₂ storage complex. Member States are required to ensure that no conflicting uses of the site take place during the period of the permit.

LICENCE TERM

An exploration permit must not be granted for longer than the "period necessary to carry out the exploration for which it is granted" (CCS Directive). This period may be extended where it turns out that the original period is insufficient to complete the exploration.

CHALLENGING LICENCES

The CCS Directive does not set out a specific mechanism for challenging the grant or refusal of an exploration or storage permit. It does, however, require that Member States set up dispute settlement arrangements, overseen by an independent authority, to enable disputes relating to access to storage sites (including, presumably, potential storage sites) to be settled expeditiously.

7.2.2 Access / tenure

SUBSEQUENT USES

The subsequent use of storage sites will depend on the outcome of the exploration. It is also likely to depend on the domestic laws of Member States, which may impose use restrictions on the available uses of sites that have been explored.

7.2.3 Planning and construction regulation applicable to CO₂ sequestration facilities

The Environmental Impact Assessment Directive requires an environmental impact assessment to be carried out before development consent is granted for certain types of projects which are judged likely to have significant environmental effects. The CCS Directive amends the Environmental Impact Assessment Directive to include CCS transport pipelines, storage sites and capture installations.

7.3 Evaluation

The CCS Directive sets out clear principles on the requirement for, duration of, and rights conferred by, exploration permits.

Notwithstanding the principles set out in the CCS Directive, the detailed requirements for obtaining exploration permits have yet to be developed. The practical (i.e. individual Member State) requirements for obtaining an exploration permit remain, therefore, somewhat uncertain.

8. Injection and pre-closure of CO₂ storage formations

8.1 Introduction

The focus of the CCS Directive is the geological storage of CO₂. The injection and pre-closure of CO₂ falls squarely within this focus and a significant proportion of the CCS Directive is devoted to the early and mid-term aspects of CO₂ sequestration. The key part of the Directive centres on the storage permitting regime which will be run by individual Member States in respect of their own territories, in association with the European Commission. If an entity does not have a storage permit, it will not be entitled to inject CO₂.

8.2 Integrated policy and legislation

8.2.1 Injection licencing

APPLICATION CRITERIA

Injection licencing falls within the scope of the storage permitting regime under the CCS Directive. As with exploration permits, the application process for storage permits must operate in a transparent and non-discriminatory manner. In contrast to the exploration permitting regime, however, the CCS Directive provides a reasonable level of detail on what a permit application should contain.¹³

By way of summary, a potential site must be subjected to a detailed analysis according to criteria specified in Annex I of the CCS Directive, including modelling of the expected behaviour of the CO₂ after injection. This initial analysis is carried out by the potential operator, who then submits the documentation to the Member State's competent authority along with the permit application. The competent authority reviews the information and, if satisfied that the condition is met, issues a draft permit decision.

The application procedure also includes a procedure for referring applications to the European Commission (CCS Directive). The purpose of the reference is not for the Commission to be the final arbiter of permit applications; the final permitting decision remains with the national competent authority according to the subsidiarity principle. Note also that the Commission is not under any obligation to opine on every permit application. However, where it does produce an opinion, the competent authority of the relevant Member States must take the views of the Commission into account. If the competent authority subsequently chooses to depart from the opinion, it will be required to submit reasons for doing so.

The holder of the exploration permit for the site should be given priority to receive a storage permit for that site, provided that the exploration of that site is completed, that any condition set in the exploration permit has been complied with, and that the application for a storage permit is made during the exploration permit's period of validity (CCS Directive).

¹³ See, in particular, CCS Directive, Article 7.

RIGHTS CONFERRED BY INJECTION LICENCE

The grant of a storage permit confers exclusive rights on the permit holder. Member States are required to ensure that only one operator is allowed for each storage site, and that no conflicting uses are permitted on the site (CCS Directive).

LICENCE TERM

The term of the storage permit is likely to depend on the particular circumstances of the storage site. It will also need to conform with provisions in the CCS Directive regarding the closure of the site and transfer of obligations to the competent authorities of Member States.

CHALLENGING LICENCES

The competent authority of a Member State is required to review, update or, as a last resort, withdraw storage permits in a number of situations, including if it becomes aware of any failure by the operator to meet the permit conditions. Member States must have dispute settlement arrangements in place, including an independent authority, to enable disputes relating to access to storage sites (including, presumably, potential storage sites) to be settled expeditiously (CCS Directive).

8.2.2 Approval processes for sequestration facility closure

APPLICATION CRITERIA

The CCS Directive provides that the closure of a storage site may occur in three situations: If the relevant conditions set out in the permit have been met; at the request of the operator, with the authorisation of the competent authority; or if the competent authority decides to do so after withdrawal of a storage permit.

CLOSURE APPROVAL PROCESS

The operator of a site must, as part of its original application for a storage permit, prepare a draft post-closure plan (CCS Directive). The competent authority will assess, approve and finalise the draft plan before a site may be closed.

8.2.3 Leakage liability

A monitoring plan must be in place to verify that injected CO₂ is behaving as expected. If, despite the precautions taken in selecting a site, a leak is identified, corrective measures must be taken to rectify the situation and return the site to a safe state (CCS Directive). In addition, EUAs must be surrendered for any leaked CO₂, to compensate for the fact that the stored emissions were exempted from surrendering obligations under the EU ETS. Finally, the requirements of the Environmental Liability Directive on repairing local damage to the environment could also apply in the case of leakage.

The detailed rules in each Member State relating to corrective measures are yet to be developed. However, as general principle, competent authorities are entitled to recover the costs incurred in relation to the measures, including by drawing the financial security that an operator may need to provide as part of its application for a storage permit. Member States must also draw up effective,

proportionate and dissuasive penalties for infringements of the national provisions that transpose the CCS Directive (CCS Directive).

8.2.4 Planning and construction regulation applicable to CO₂ sequestration facilities

As noted in Section 7.2.3, the Environmental Impact Assessment Directive requires an environmental impact assessment to be carried out before development consent is granted for certain types of project which are likely to have significant environmental effects.

ENVIRONMENTAL IMPACT ASSESSMENT

8.3 Taxation of injection and pre-closure of CO₂ sequestration facilities

There is no European-level taxation of injection or pre-closure CO₂ sequestration facilities. It will be for each Member State to consider the application of its domestic taxation scheme to such facilities.

8.4 Evaluation

Strengths:

The CCS Directive includes detailed principles governing the injection and pre-closure of storage sites. As such, its entry into force is a notable development.

Weaknesses:

There are still uncertainties as to how injection and pre-closure will work in practice since the relevant rules and procedures are yet to be finalised by individual Member States. In addition, at the EU-level, although the injection stream must "overwhelmingly" consist of CO₂, the European Commission has yet to produce guidance to identify what this means in practice (CCS Directive).

9. Post-closure and long-term storage of CO₂

9.1 Introduction

The CCS Directive's approach to post-closure and long term storage is an important feature of the Directive. The Directive provides detailed principles which clarify the ongoing obligations of site operators and makes provision for the subsequent transfer of those obligations to the competent authorities of Member States.

9.2 Integrated policy and legislation

9.2.1 Obligations of approval authorities

The operator of a storage site will remain responsible for maintenance, monitoring and control, reporting, and corrective measures following closure. Eventually, however, these obligations will transfer to the competent authority of the relevant Member State, provided that the following conditions have been met (CCS Directive):

- all available evidence indicates that the stored CO₂ will be completely and permanently contained;
- a minimum period, to be determined by the competent authority, has elapsed. This minimum period shall be no less than 20 years, unless the competent authority is convinced that the stored CO₂ will be completely and permanently contained;
- the operator has provided an adequate financial contribution to the anticipated costs of monitoring for a period of 30 years; and
- the site has been sealed and the injection facilities have been removed.

After the transfer of responsibility to the competent authority, inspections of the site "may be reduced to a level which allows for detection of leakages or significant irregularities" (CCS Directive). Only if leakages or significant irregularities are detected will increased monitoring and, possibly, corrective measures be required.

9.2.2 Monitoring and reporting obligations

It is important that a monitoring plan must be included in the application for a storage permit. This plan should include specific monitoring obligations appropriate to the particular storage site. The monitoring plan must be updated according to criteria set out in Annex II of the CCS Directive and (and in any case, every five years) to take account of changes to the assessed risk of leakage, changes to the assessed risks to the environment and human health, new scientific knowledge and improvements in best available technology. Updated plans must be re-submitted for approval to the competent authority. The operator is required to report to the competent authority, *inter alia*, on the results of monitoring at least once a year.

In addition, Member States must establish a system of inspections to ensure that the storage site is operated in compliance with the requirements of the CCS Directive.

9.2.3 Leakage liability

The competent authorities in Member States will be responsible for taking measures to correct any post-closure liability after the transfer of responsibilities. Member States are required to ensure that each operator makes a financial contribution to the competent authority to cover, at a minimum, the anticipated cost of monitoring for a period of 30 years. This financial contribution may also be used to cover the costs borne by the competent authority to ensure that the CO₂ is completely and permanently contained (CCS Directive).

Notably, however, the basis for the arrangements between the operator and the relevant Member State is within the competence of the Member State (CCS Directive). The European Commission may adopt guidelines to assist with the estimation of the costs referred to above, but has not yet done so.¹⁴

The Environmental Liability Directive seeks to ensure the prevention and remedying of environmental damage. Specifically, it seeks to prevent and remedy damage to habitats and species protected by EU law, and to habitats or species on a site of special scientific interest, damage to water resources, and land contamination which presents a threat to human health. The Environmental Liability Directive reinforces the “polluter pays” principle - making operators financially liable for threats of or actual damage. The CCS Directive amends Directive 2004/35/EC extending it to cover CCS storage.

9.3 Evaluation

The CCS Directive, in conjunction with the Environmental Liability Directive, provides the key framework for post-closure liability. It establishes principles that should address this potential key barrier to the widespread commercialisation of CCS technology.

Although the CCS Directive is a significant step, further legislative and policy measures are needed both at a Member State and EU-level. At the EU-level, the European Commission has yet to publish guidelines (as envisaged by the CCS Directive) on the transfer of responsibility following storage and the calculation of the financial contribution that operators will be required to make to competent authorities for the post-transfer period. Member State developments are beyond the scope of this review.

¹⁴ The Commission's authority to adopt guidelines is conferred by the CCS Directive, Article 20(2).

10. Summary

10.1 CCS policy and legislation 'best practice'

The European approach to CCS policy and legislation represents some of the most advanced proposals for the regulation of commercial CCS facilities. The CCS Directive, in particular, sets out a clear regulatory framework for CCS projects in Member States, a significant step towards the widespread deployment of CCS technology. It endeavours to remove regulatory barriers to CCS projects and, in doing so, amends a number of European legislative instruments, including:

- Environmental Impact Assessment Directive (85/337/EEC);
- Water Framework Directive (2000/60/EC);
- Large Combustion Plant Directive (2001/80/EC);
- Environmental Liability Directive (2004/35/EC);
- Waste Directive (2006/12/EC); and
- Shipments of Waste Regulation (1013/2006).

These amendments, together with the CCS Directive itself, the Revised ETS Directive and M&R Guidelines, provide a developing framework of European law and policy that is intended to facilitate the development of CCS projects across the EU

10.2 Gaps in CCS policy and legislation

The EU has demonstrated significant progress. However, further legislative and policy measures are needed if the widespread deployment of CCS technology is to progress. By way of example, the European Commission has been tasked to prepare and adopt guidelines on a number of issues relating to the CCS Directive, including:

- determining the composition of the CO₂ stream intended for geological storage;
- the transfer of responsibility following storage; and
- the calculation of the financial contribution for the post-transfer period.

In addition, there is a need to conduct reviews of certain other European legislation (such as the Seveso II Directive) to ensure that the capture, transport and storage of CO₂ is consistent with such legislation.

The most significant stage that remains, however, is that the European-level initiatives must be transposed into the domestic law of Member States. The potential for multi-jurisdictional CCS projects and the fact that geological storage sites are not spread uniformly across the EU means that effective and consistent transposition could be an important factor in the success of any European cross-border CCS projects.

10.3 Priority areas for future policy and legislative development

The key priority areas at the EU-level will be to address the gaps referred to in Section 10.2 above, establish guidelines to clarify certain provisions of the CCS Directive and to assist Member States with

their domestic implementation of the Directive. The European Commission will also need to ensure that it has sufficient resources to fulfil its own obligations under the CCS Directive.

At the Member State level, the priority for national governments will be to focus on the domestic implementation of the CCS Directive.

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Council Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Council Directive 2008/1/EC of 15 January 2008 concerning integrated pollution prevention and control.

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