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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**on the implementation of Directive 2009/31/EC on the geological storage of carbon
dioxide**

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1. INTRODUCTION

Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006¹ (so-called Carbon Capture and Storage Directive – hereinafter ‘CCS Directive’) was adopted on 23 April 2009 together with other parts of the 2009 climate-energy package². The CCS Directive establishes a legal framework for the environmentally safe geological storage of carbon dioxide (CO₂) to contribute to mitigating climate change. The CCS Directive aims to ensure that there is no significant risk of leakage of CO₂ or damage to health or the environment, and to prevent any adverse effects on the security of the transport network or storage sites. The Directive lays down requirements covering the entire lifetime of a storage site. It also contains provisions on the capture and transport components of CCS, though these activities are covered mainly by existing EU environmental legislation, such as the Environmental Impact Assessment (EIA) Directive³ or the Industrial Emissions Directive⁴, in conjunction with amendments introduced by the CCS Directive. Seven pieces of EU environmental legislation are amended via Articles 31 to 37, inter alia in order to remove legal barriers to geological storage of CO₂.

Article 27(1) of the CCS Directive requires the Member States to submit to the Commission a report on the implementation of the Directive, drawn up on the basis of a questionnaire adopted by the Commission⁵. The Member States’ reports, which were delivered to the Commission between July 2011 and April 2013, fed into this first report from the Commission on the implementation of the CCS Directive, as required by its Article 38(1).

Broader policy issues surrounding this subject, such as possible options to encourage CCS demonstration and early deployment, are discussed in the Consultative Communication on the Future of Carbon Capture and Storage in Europe⁶ and further taken up by the recent European Parliament Resolution on implementation report 2013: developing and applying carbon capture and storage technology in Europe⁷.

2. GENERAL PROGRESS IN IMPLEMENTATION

Article 39(1) of the CCS Directive required the Member States to bring into force the laws, regulations and administrative provisions necessary to comply with the Directive by 25 June 2011. By that deadline only a few Member States had reported either full or partial

¹ OJ L 140, 5.6.2009, p. 114-135

² http://ec.europa.eu/clima/policies/package/index_en.htm

³ Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ L 175, 5.7.1985, p. 40-48)

⁴ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17-119)

⁵ Commission Decision 2011/92/EU of 10 February 2011 (OJ L 37, 11.2.2011, p. 19-24)

⁶ COM(2013) 180 final; a summary of the consultation results is available under http://ec.europa.eu/energy/coal/ccs_en.htm

⁷ 2013/2079(INI)

transposition, so the Commission sent letters of formal notice for non-communication of national measures to 26 Member States in July 2011. By October 2013 all Member States had notified transposition measures to the Commission. This allowed the Commission to close 19 of the 26 infringement cases by November 2013. The majority of Member States have completed transposition of the Directive; Austria, Cyprus, Hungary, Ireland, Sweden and Slovenia have, however, not yet notified complete transposing measures. On account of this partial non-communication the Commission addressed reasoned opinions⁸ to these six Member States in November 2013. One remaining Member State which received a letter of formal notice for non-communication, notified its transposition measures at the time when this report was drafted; its completeness check will be finalised by spring 2014. The Commission started to check if the notified measures, while complete, also conform in substance to the CCS Directive.

Member States took different approaches to the transposition of the CCS Directive. While several decided to only amend existing legislation, most Member States opted for a combination of new specific legislation on the geological storage of CO₂ and amendments to existing legislation. Besides similar approaches taken in transposing the amendments to six EU Directives introduced through Articles 31 to 35 and 37 of the CCS Directive, amendments to existing legislation show some commonalities across the EU: 17 Member States made amendments to their environmental legislation and eight of these made changes also to their mining legislation. Article 23 of the CCS Directive requires each Member State to designate competent authorities responsible for fulfilling the duties established under the Directive. While a few Member States chose a single competent authority, most Member States assigned responsibilities to multiple authorities, as CCS intersects with a number of different regulatory areas. The most frequently chosen competent authorities are environmental bodies (18 Member States), followed by institutions responsible for the fields of economy, energy and mining.

As per Article 4(1) of the CCS Directive, Member States retain the right to determine the areas from which storage sites may be selected, including the right not to allow storage in any part of their territories. Some Member States have begun to determine potential CO₂ storage sites. Most Member States however have not yet finalised the assessment. An appraisal of CO₂ storage capacity was provided by the EU GeoCapacity project⁹, which estimated for the 21 participating Member States theoretical storage potential of 87 Gt CO₂ (69 Gt in deep saline aquifers, 17 Gt in depleted hydrocarbon fields and 1 Gt in unmineable coal beds).

Whereas most Member States do allow geological storage of CO₂, some have reported a decision not to allow CO₂ storage on their territory or part of it due to unsuitability of their geology for CO₂ storage (Finland, Luxembourg and the Brussels Capital Region of Belgium). Some other Member States have also not allowed geological storage of CO₂ (Austria, Estonia, Ireland, Latvia, Slovenia, Sweden) or restricted it (Czech Republic¹⁰, Germany¹¹).

According to Article 10(1) of the CCS Directive, storage permit applications should be made available to the Commission, so that the Commission may issue a non-binding opinion on them. The aim is to ensure consistency in implementation of the requirements of the CCS

⁸ under the first paragraph of Article 258 of the Treaty on the Functioning of the European Union

⁹ Vangkilde-Pedersen, T. et al. 2009. FP6 EU GeoCapacity Project, Assessing European Capacity for Geological Storage of Carbon Dioxide, Storage Capacity, WP2, D16 report, 166 pp, <http://www.geology.cz/geocapacity/publications>

¹⁰ CO₂ storage in natural rock formations will not be authorised in the Czech Republic before 1 January 2020.

¹¹ Germany has imposed restrictions on the annual quantity of CO₂ that can be stored: 4 Mt CO₂ is the national total and 1.3 Mt of CO₂ is permitted per storage site.

Directive across the EU and also to help enhance public confidence in CCS. On 28 February 2012 the Commission adopted its first such opinion¹², reviewing the draft permit issued by the Netherlands for intended permanent storage of up to 8.1 Mt CO₂ in a storage reservoir on the Dutch continental shelf.

In addition to checking the transposition of the CCS Directive and reviewing draft storage permits, the Commission performs other activities in order to support consistent implementation of the CCS Directive throughout the EU. In September 2009 an Information Exchange Group of experts from Member States was set up under Article 27(2) of the CCS Directive. The group has met seven times so far. In March 2011 four guidance documents¹³ were published with a view to providing an overall methodological approach to implementation of the key provisions of the CCS Directive. The guidance documents are mainly addressed to the competent authorities and to relevant stakeholders. The first guidance document outlines a CO₂ storage life cycle risk management framework, whereas the other three address issues such as the characterisation of the storage complex, CO₂ stream composition, monitoring and corrective measures, the criteria for transfer of responsibility to the competent authority, financial security and financial mechanism.

3. SPECIFIC IMPLEMENTATION ISSUES IN THE MEMBER STATES

3.1. Permitting of CO₂ storage

Under Article 4(3) of the CCS Directive, the suitability of a storage site is determined through a characterisation and assessment of the potential storage complex and surrounding area pursuant to criteria specified in Annex I to the CCS Directive. The Member States which allow CO₂ storage on their territory have implemented this provision mostly by incorporating Annex I into their legislation.

Where Member States determine that exploration is required to generate the information necessary for selection of CO₂ storage sites, they must ensure that no such exploration takes place without an exploration permit. While some Member States require exploration only in cases where there is too little information to apply directly for a storage permit, others always require exploration permits. With regard to limiting the volume of the explored area, some Member States (e.g. Portugal) limit it directly, while others (e.g. Bulgaria and Hungary) limit only the territory of the surface area, which indirectly determines the maximum exploration volume. Several Member States (e.g. Czech Republic, Spain, France, Italy, Poland and United Kingdom) have already issued exploration permits or are in the process of issuing them.

Article 6 of the CCS Directive requires that no storage site is operated without a storage permit. Articles 7 to 11 elaborate on storage permit applications, conditions and contents, as well as on potential changes, review, update and withdrawal of storage permits. The transposing provisions for these Articles are very similar in the legislation of most Member States. Together with the Commission's review of draft storage permits pursuant to Article 10(1)¹⁴, this should result in consistent implementation of the permit-related provisions throughout the EU.

3.2. Obligations for operation of the storage sites

Article 12 of the CCS Directive specifies CO₂ stream acceptance criteria and procedures. While the transposing acts of most Member States include a generic requirement that the

¹² C(2012) 1236

(http://ec.europa.eu/clima/policies/lowcarbon/ccs/implementation/docs/c_2012_1236_en.pdf)

¹³ http://ec.europa.eu/clima/policies/lowcarbon/ccs/implementation/documentation_en.htm

¹⁴ See Chapter 2 for details on the Commission review of the first draft storage permit in the EU

stream must consist mostly of CO₂, and that no waste can be added for the purpose of disposing of it, a few Member States impose specific limits for the components of the CO₂ stream. Several Member States which restrict CO₂ storage on their territory have not yet communicated transposing provisions for Article 12, whereas most Member States have communicated provisions ensuring that a storage operator may accept and inject CO₂ streams only if an analysis of the composition of the streams and a risk assessment was carried out with a positive conclusion. As regards the procedures for monitoring adherence to these requirements, some Member States require operators to report the composition of the CO₂ stream at regular intervals (e.g. at least once a month in Estonia, and at least every six months in Germany).

Monitoring provisions (Article 13) stipulate that operators must carry out monitoring of the injection facilities, the storage complex and where appropriate the surrounding environment, based on a monitoring plan. The Member States which allow CO₂ storage on their territory require the monitoring plan to be submitted to the competent authority for approval as part of the storage permit application. Most Member States have included in their national legislation the requirements for the monitoring plan to comply both with Annex II to the CCS Directive and with reporting requirements¹⁵ under the ETS Directive¹⁶. Luxembourg, for example, requires monitoring results to be compared with the behaviour predicted by the 3D dynamic simulation for pressure-volume and saturation.

In the majority of the Member States, operators must report to the competent authorities at least once a year, as per Article 14 of the CCS Directive. Many Member States lay down a requirement to report more frequently, should the competent authority request these reports.

A system of routine and non-routine inspections of all storage complexes, with a publicly available outcome, is called for in Article 15. The Member States which allow CO₂ storage on their territory have implemented the provision for carrying out routine inspections at least once a year until three years after closure. Germany has a more stringent inspection requirement — there the routine inspections need to take place once a year even after closure of the site.

Article 16 of the CCS Directive stipulates that in case of leakages or significant irregularities, Member States must ensure that the operator notifies the competent authorities and takes the required corrective measures. The Member States which allow CO₂ storage on their territory have made sure that a corrective measures plan needs to be submitted for approval to the competent authority as part of the storage permit application. A few Member States lay down specific additional requirements in case the operator fails to perform corrective measures, such as fines or permit withdrawal.

3.3. Closure and post-closure obligations

The Member States which allow CO₂ storage on their territory have implemented Article 17, which stipulates that after closure of a storage site the operator remains responsible for monitoring, reporting and corrective measures, and for all obligations relating to the surrender of allowances in case of leakages, until the responsibility for the storage site is transferred to

¹⁵ Commission Decision 2007/589/EC of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions, recently replaced by Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions (OJ L 181 , 12.7.2012, p. 30–104)

¹⁶ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, p.32-46)

the competent authority. The post-closure plan for this period must be designed in accordance with Annex II to the CCS Directive, which lists monitoring requirements.

The Member States which allow CO₂ storage on their territory have also implemented Article 18, according to which responsibility for the storage site is transferred to the competent authority only if certain conditions are met by the operator. These conditions include availability of a financial contribution to cover costs of post-transfer obligations, and submission of a report documenting evidence that the stored CO₂ will be completely and permanently contained. As for the minimum period between the closure of the site and the transfer of responsibility, most Member States' legislation requires at least 20 years, unless the competent authority is persuaded earlier that the stored CO₂ will be completely and permanently contained. A few Member States opt for longer default periods of 30 or 40 years, while others aim to judge exclusively on a case-by-case basis.

3.4. Financial guarantees

The CCS Directive provides for two financial mechanisms – financial security for the period until the transfer of responsibility, and financial contribution for the period after the transfer of responsibility.

Article 19 of the CCS Directive requires potential operators to provide financial security to ensure that all obligations under the storage permit can be met, both for the operation period and for the closure and post-closure period, including the obligations related to surrendering of allowances in case of leakages. The purpose of the financial security is to ensure that the costs of fulfilling these obligations (such as monitoring or measures in case of leakages) are covered, should the operator not be in a position to do so. The financial security needs to be valid and effective before the commencement of injection and must be presented by the operator as a part of the application for a storage permit. While many Member States merely mirror the Article 19 requirements in their legislation, some have adopted additional requirements and laid down guidelines on specific instruments and calculations of financial security. For instance, Hungary has set a minimum amount of HUF 200 million (around EUR 671 000)¹⁷ for financial security, based on its 1993 Mining Act. As regards potential financial instruments recommended by some Member States for financial security, the list includes adequate insurance cover, an escrow bank account, a bank guarantee, or a parent company guarantee. These instruments are recommended also by the Guidance Document 4¹⁸.

Article 20 of the CCS Directive requires operators to make a financial contribution available to the competent authority before the transfer of responsibility, in order to cover the post-transfer costs. The Member States which allow CO₂ storage on their territory have made sure that the amount of the contribution will take into account criteria listed in Annex I to the CCS Directive and the history of storing CO₂ at the specific site, and that it will cover at least the anticipated cost of monitoring for a period of 30 years. Some Member States lay down additional requirements for the financial contribution. For example, Germany requires the operator to save 3% of the amount saved by the emission rights holder through CO₂ storage, in each year of operation. This amount will be kept in an interest-bearing deposit account with the competent authority, and will be offset with the security before the transfer of responsibility. In the Czech Republic, as another example, the amount of financial contribution must take into account the anticipated cost of monitoring for at least 50 years after the transfer of responsibility.

¹⁷ This amount was converted to EUR according to Euro foreign exchange reference rates for the European Central Bank on 22 November 2013

¹⁸ <http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html>
http://ec.europa.eu/clima/policies/lowcarbon/ccs/implementation/docs/gd4_en.pdf

3.5. Amendment of six Directives and transboundary issues

Six existing EU Directives were amended by the CCS Directive, in order to ensure a high level of protection of the environment and human health from the risks posed by geological storage of CO₂.

All Member States which notified the Commission of their transposing measures communicated the implementation of Articles 31, 35 and 37 of the CCS Directive, which introduce respectively:

- amendments to Annexes I and II of the EIA Directive to cover storage sites, as well as capture and transport of CO₂ streams for the purpose of geological storage;
- exclusion of the CO₂ captured and transported for the purpose of geological storage, from the instruments associated with the Waste Framework Directive¹⁹;
- an amendment to Annex I of the Industrial Emissions Directive to include the capture of CO₂ streams for the purpose of geological storage, as one of the activities covered under this Directive.

All Member States which notified the Commission of their transposing measures communicated also the implementation of Article 33 of the CCS Directive, which amends the Large Combustion Plant Directive²⁰. According to this Article the Member States need to ensure that operators of combustion plants with a rated electrical output of 300 MW or more assess the technical and economic conditions necessary for future application of carbon capture and storage. Where the assessment is positive, suitable space has to be set aside on the installation site for the equipment necessary to capture and compress CO₂. In the United Kingdom additional guidance was issued, stipulating that no new combustion plant with an electrical generating capacity of 300 MWe or more would be consented unless it could demonstrate to match Article 33 criteria. The guidance also gives advice on the information that applicants should submit to demonstrate this.

Several Member States (e.g. Germany, France, Hungary, Poland, Romania, Slovenia and United Kingdom) have reported practical application of this amendment to the Large Combustion Plant Directive after 25 June 2009. For instance, an area of 6000 m² was reserved on the installation site of a large combustion plant in Mannheim, Germany, authorised on 27 July 2009, with a view to allowing for later retrofit for CO₂ capture.

Articles 32 and 34 of the CCS Directive amend respectively the Water Framework Directive²¹, to allow for injection of CO₂ into saline reservoirs, and Annex III of the Environmental Liability Directive²², to include operation of CO₂ storage sites. These Articles are to be transposed by those Member States which allow CO₂ storage on their territory.

¹⁹ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3-30), including Directive 2006/12/EC on waste

²⁰ Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants (OJ L 309, 27.11.2001, p. 1-21), which will be repealed by the above-mentioned Industrial Emissions Directive with effect from 1 January 2016

²¹ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OL L 327, 22.12.2000, p. 1-73)

²² Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OL L 143, 30.4.2004, p. 56-75)

Whereas many Member States have adopted specific legislative provisions addressing transboundary transport of CO₂ and transboundary storage sites or complexes, only a few have specific CCS-related transboundary experience. One example of such transboundary cooperation is the North Sea Basin Task Force where public and private bodies from Germany, the Netherlands and the United Kingdom have developed common principles for managing and regulating the transport, injection and permanent storage of CO₂ in the North Sea sub-seabed²³.

4. CONCLUDING REMARKS

Assessments made in the context of the EU's Roadmap for moving to a competitive low carbon economy in 2050²⁴ and the Energy Roadmap 2050²⁵ see CCS, if commercialised, as an important technology contributing to the transition to a low carbon energy system in the EU. Proper and consistent implementation of the CCS regulatory framework across Europe, in particular regarding the selection, operation, closure and post-closure of storage sites and the assessment to retrofit large combustion plants for CO₂ capture, is of paramount importance with a view to supporting the demonstration and subsequent deployment of CCS in an environmentally safe way and boosting public confidence in the technology.

The report shows that by now all Member States notified transposition measures to the Commission. In this connection, most Member States opted for a combination of new specific legislation on the geological storage of CO₂ and amendments to existing legislation. The majority of the Member States have assigned responsibilities to more than one competent authority. The assessment of potential CO₂ storage sites is ongoing, with several Member States issuing exploration permits and the Commission reviewing one submitted draft storage permit. The Member States which allow CO₂ storage on their territory have communicated implementation of the provisions on monitoring, reporting and inspections, leakages and significant irregularities, closure and post-closure obligations, as well as the two financial mechanisms established by the CCS Directive. As regards Member States which restrict or prohibit CO₂ storage on their territory, some transposed only the provisions of the Directive that deal with capture and transport aspects of CCS, while others transposed all the provisions of the Directive, including the storage related Articles.

The Commission underlines the importance of consistent implementation of the CCS Directive across the EU. It therefore pursues infringement cases for partial non-communication of transposing measures and it is checking whether the notified measures conform in substance to the CCS Directive. The information obtained for this report, together with overall experience with CCS, technical progress and the most recent scientific knowledge will provide inputs for the preparation of the next Commission report, which will assess in particular the aspects of CCS listed in Article 38(2) of the Directive. That review report is to be transmitted to the European Parliament and the Council by 31 March 2015.

²³ 'Storing CO₂ under the North Sea Basin: A key solution for combating climate change' (2007) at <http://www.globalccsinstitute.com/category/organisation/north-sea-basin-task-force> and 'One North Sea: A study into North Sea cross-border CO₂ transport and storage' (2010) at <http://www.npd.no/no/Publikasjoner/Rapporter/Samarbeider-om-CO2-lager/>

²⁴ COM(2011) 112 final

²⁵ COM(2011) 885 final