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

**on Implementation of Directive 2009/31/EC on the Geological Storage of Carbon  
Dioxide**

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## **on Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide**

### **1. INTRODUCTION**

Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide<sup>1</sup> (the Carbon Capture and Storage Directive, or CCS Directive) establishes a legal framework for the environmentally safe geological storage of carbon dioxide (CO<sub>2</sub>). The CCS Directive aims to ensure that there is no significant risk of CO<sub>2</sub> leakage or damage to health or the environment, and to prevent any adverse effects on the security of the transport network or storage sites.

This report constitutes the fourth implementation report on the CCS Directive and covers the period of May 2019 - April 2023. It analyses progress made since the third implementation report<sup>2</sup>. It is based on the reports submitted by Member States to the European Commission, and by the EEA EFTA States Norway, Iceland and Liechtenstein to the EFTA Surveillance Authority (ESA)<sup>3</sup>, in accordance with Article 27 of the CCS Directive. Twenty-five countries<sup>4</sup> submitted reports in time to be considered in this report.

### **2. SPECIFIC IMPLEMENTATION ISSUES IN THE MEMBER STATES**

#### **2.1 Change, reviews and updates to national implementation legislation**

Since the third implementation report, Bulgaria, Denmark, Greece, France, Lithuania, Hungary, Finland, Sweden and Iceland have reported changes to their legislation implementing the CCS Directive. These changes include opening areas for storage, establishing permitting procedures and designating competent authorities.

After allowing exploration and research projects since 2015, since 2021 Iceland has allowed industrial-scale geological storage of carbon dioxide (CO<sub>2</sub>) on its territory. Hungary has laid down detailed rules for geological structures suitable for storing carbon dioxide.

Denmark has established legislation to open certain areas to continuous granting of permits for exploration and storage of carbon dioxide, designating the national permitting authority and enabling state participation in every storage permit. Greece has designated the competent authority

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<sup>1</sup> 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 1013/2006, OJ L 140, 5.6.2009, p. 114-135

<sup>2</sup> COM(2019) 566, 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

<sup>3</sup> Forthcoming report by the EFTA Surveillance Authority under the CCS Directive for the EEA EFTA States

<sup>4</sup> Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Greece, Spain, France, Cyprus, Lithuania, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Iceland, Liechtenstein, Norway

and established permitting procedures for economic operators with existing rights for hydrocarbon exploration and production in the relevant areas.

France has specified and simplified the procedures for the necessary environmental impact assessments in the context of exploration or storage permits. Finland gives priority to CCS projects in environmental permitting. Bulgaria and Sweden have clarified the way they implement the post-closure requirements set out in the Directive. Additional revisions of implementing legislation are ongoing in Belgium and Iceland.

At the time of reporting, geological storage of carbon dioxide is allowed in all Member States, Iceland and Norway except in Germany, Estonia, Ireland<sup>5</sup> Cyprus, Latvia<sup>6</sup>, Austria, Finland and Slovenia. In Lithuania the geological storage of carbon dioxide has been prohibited since July 2020.

## **2.2 Exploration permits and storage permits**

### *a) Permitting process/application*

Denmark, France, Hungary, the Netherlands, Iceland and Norway have established processes through which storage permit applicants can engage with the competent permitting authority. These Member States invite potential applicants to contact and engage with the authorities for information and advice. Malta intends to proactively engage with potential future applicants. Portugal is currently developing processes for future permit applications. Icelandic law foresees the option of pre-consultation as part of the environmental impact assessment. Norwegian law obliges Norwegian authorities to provide guidance to the parties concerned.

### *b) Storage permits*

Since the third implementation report, the Netherlands is the only reporting country that has issued storage permits. Two permits were issued in 2021 and 2022, as part of the Porthos project, which will store CO<sub>2</sub> in a depleted gas field in the North Sea.

### *c) Exploration permits*

Since the last implementation report, Denmark has conducted its first tendering process for offshore licenses for full-scale exploration and storage of CO<sub>2</sub> in specific areas on the Danish continental shelf. Denmark has awarded three offshore exploration permits.

Greece has issued one exploration permit for CO<sub>2</sub> storage to explore the potential for storage at the Prinos complex, where the permit holder currently holds the rights to oil and gas exploration and production.

Norway awarded three exploration permits in 2022, two for areas in the North Sea and one for an area in the Barents Sea. In 2023, Norway awarded two more exploration permits in the North Sea.

The other reporting states have not granted any exploration permits in the reporting period and have not reported filed applications.

### *d) Operators' plans to apply for storage permits*

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<sup>5</sup> Information based on previous reporting.

<sup>6</sup> Ibid.

The Netherlands has notified the European Commission of three storage applications for offshore areas, namely for K14-FA from Shell International Exploration and Production B.V. and Shell Gas & Power Developments B.V., for P18-6 from TAQA Offshore B.V. and EBN CCS B.V., and L04-A from TotalEnergies EP Nederland B.V..

Iceland, Liechtenstein and Norway notify permit applications to the EFTA Surveillance Authority (ESA). The ESA is currently reviewing one storage permit application from Iceland and one from Norway. Iceland expects to receive another application in early 2024.

The following Member States expect to receive several applications for storage permits in 2023 and the first half of 2024: Netherlands (2-3), Greece (1), and Romania (1).

Denmark and France expect to receive more applications in the coming years, France in early 2024 and Denmark by 2028, depending on progress of ongoing projects.

### **2.3 Selection of areas for storage sites**

Five Member States report that they have determined areas from which storage sites may be selected. France and Spain explicitly mentioned their entire territory as potential storage sites. Hungary, Romania and Iceland mentioned no specific limitations in their areas, while the Netherlands exclude onshore areas. Denmark has designated specific areas for potential geological storage of CO<sub>2</sub> and is currently conducting an assessment to select up to eight additional storage sites. At the time of reporting, Sweden was also in the process of investigating and defining specific potential storage sites. Poland states that it defined storage areas in 2014 and has not defined any new ones since then.

Greece plans to determine additional areas from which storage sites may be selected and is currently in the process of conducting the respective geological studies. At the time of reporting, Poland, Portugal and Slovenia were at different stages of investigating and defining additional storage sites. Czechia states that saline aquifers and partially depleted oil and gas fields would be available as storage sites, but only with limited capacity.

Among countries planning to determine additional storage areas, ten prioritise specific geological possibilities, namely saline aquifers (CZ, DK, EL, HU, PL, PT, SE, NO), depleted hydrocarbon fields (CZ, EL, PL, RO) or mafic rock formations (EL, PT, IS).

The Netherlands and Romania are the only reporting countries where certain areas do not necessarily require an exploration permit to generate the information necessary for selecting storage sites. This concerns CO<sub>2</sub> storage in depleted oil or gas fields, which do not require new exploration activities, because the existing data is considered sufficient. In all other reporting countries, exploration permits are required for all companies to generate the necessary subsoil information.

Six Member States (Czechia, Denmark, Spain, France, the Netherlands, and Romania) as well as Iceland report that there is or will be information available to citizens about environmental and/or health risks relating to the geological storage of CO<sub>2</sub>. In the Netherlands and Romania such information will be made available to the public together with the respective applications for permits. In 2023, France carried out a public consultation on its initial strategic guidelines to guide the deployment of Carbon Capture, Storage and Utilisation (CCUS) technologies.

## 2.4 Third-party fair and open access

At the time of reporting, no reporting country is aware of prospective transport and/or storage operators refusing access to their facilities on grounds of lack of capacity. Nevertheless, several reporting countries have procedures in place to ensure that potential users are able to obtain fair and open access to transport networks and storage sites. There are legislative measures for that purpose in place in Belgium, Denmark, Germany, France, the Netherlands, Austria, Poland, Portugal, Slovenia, Iceland and Norway.

## 2.5 Cross-border cooperation

The locations of initial geological CO<sub>2</sub> storage opportunities and hard-to-abate energy intensive industries that could capture CO<sub>2</sub> emissions are not evenly distributed among Member States and EEA countries. This requires cross-border cooperation as regards CO<sub>2</sub> transport and/or storage sites.

Several reporting countries have supported in total 18 applications for Projects of Common Interest (PCI) or Projects of Mutual Interest (PMI) covering cross-border CO<sub>2</sub> transport, in accordance with the revised TEN-E Regulation<sup>7</sup> (BE, DK, DE, ES, FR, HR, LV, LT, HU, NL, PL, SE, NO).

Belgium and Denmark reported an ongoing cross-border project where CO<sub>2</sub> captured in Belgium is transported to Denmark for storage. The Netherlands reported on the ongoing ARAMIS PCI, which aims to import CO<sub>2</sub> for storage in the Netherlands.

Belgium reports several ongoing transnational transport and storage projects. Croatia and Hungary are preparing a project for transporting CO<sub>2</sub> for storage in Croatia. Lithuania (2) and Poland (1) supported applications of projects to be awarded the Projects of Common Interest status. Swedish companies that plan to capture CO<sub>2</sub> are in contact with storage operators in Norway and Denmark. In Iceland, the Coda Terminal project aims to import captured CO<sub>2</sub> for geological storage and is supported by the ETS Innovation Fund.

Three Member States that are party to the international 1996 Protocol to the Convention on the Prevention of Maritime Pollution by Dumping of Waste and Other Matter, 1972 (“London protocol”) – Belgium, Denmark and the Netherlands – have signed joint Memoranda of Understanding on the cross-border transportation of CO<sub>2</sub> between them with the purpose of geological storage.

These Memoranda of Understanding have been limited to residual issues that are not covered by EU law, such as cooperation between the responsible permitting authorities. Directive 2009/31 and Directive 2003/87 are the applicable legal framework in place in the European Economic Area for the capture, cross-border transport and safe geological storage of carbon dioxide between EU Member States and the EEA.

Accordingly, any operator of CO<sub>2</sub> transport networks and/or CO<sub>2</sub> storage sites enjoys the full benefit of the EU legal framework to import or export captured CO<sub>2</sub>. The implemented EU legal framework<sup>8</sup> acts as the relevant “arrangement” between the Parties in the meaning of Art. 6(2) of

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<sup>7</sup> [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L\\_.2022.152.01.0045.01.ENG&toc=OJ%3AL%3A2022%3A152%3ATOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2022.152.01.0045.01.ENG&toc=OJ%3AL%3A2022%3A152%3ATOC)

<sup>8</sup> The EEA treaty and the incorporation of the two directives concerned in the EEA legal regime provides the necessary arrangement with EEA partners.

the London Protocol, given the substantive alignment with the requirements of the London Protocol.<sup>9</sup>

## **2.6 National and international programmes and research projects**

A majority of reporting countries (BE, DK, DE, ES, FR, LT, NL, PT, RO, SI, FI SE, IS, NO) have national operational programmes or plans in place to support research, demonstration and deployment of carbon capture and storage. Most of these programmes are not exclusively dedicated to carbon capture and storage.

Seven reporting countries have measures/programmes in place to financially support the development or deployment of CCS. These countries are Belgium, Denmark, Germany, France, the Netherlands, Slovenia and Norway. Greece and Sweden plan such support.

16 Member States (BE, DK, DE, EE, EL, ES, FR, LT, MT, NL, AT, PL, PT, RO, FI, SE) are involved in ongoing national or European research projects that address topics relevant for implementing the Directive, such as ENCASE<sup>10</sup> (funded via the Horizon Europe programme), SHARP and RETURN (funded via the ERA-NET ACT (Accelerating CCS Technologies))<sup>11</sup>, CCS4CEE<sup>12</sup>, and PilotSTRATEGY<sup>13</sup>. Member States involved in such projects are Belgium, Denmark, Germany, Estonia, Greece, Spain, France, Lithuania, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Finland, and Sweden.

Beyond these projects, ten Member States report that they have further plans to support the appraisal of CO<sub>2</sub> storage sites, to prepare for CO<sub>2</sub> transport infrastructure or for the establishment of CO<sub>2</sub> hubs and clusters. These Member States are Czechia, Denmark, Germany, Greece, France, Lithuania, Hungary, the Netherlands, Poland and Sweden. Those plans are at different stages of development.

## **2.7 CO<sub>2</sub> capture readiness**

Pursuant to Article 9a of Directive 2001/80/EC<sup>14</sup>, when an operator applies for a license to run a combustion plant with a rated electrical output of 300 megawatts or more, it has to assess the technical and economic feasibility of carbon capture, transport and storage. If the assessment is positive, space on the installation site must be set aside for the equipment necessary to capture and compress CO<sub>2</sub>.

Only Belgium, Germany and Poland have combustion plants with a rated electrical output of 300 MW or more that have received a permit since the last implementation report. At the time of

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<sup>9</sup> To transport CO<sub>2</sub> from one Member State to another within the European Economic Area, Member States that are parties to the London Protocol are still required to first deposit with the London Protocol Secretariat a formal declaration of provisional application of the 2009 amendment to the London Protocol, even if there are no additional issues to cover. Therefore, there is no need to sign a bilateral agreement or arrangement.

<sup>10</sup> <https://cordis.europa.eu/project/id/101094664>

<sup>11</sup> <http://www.act-ccs.eu/>

<sup>12</sup> <https://ccs4cee.eu/>

<sup>13</sup> <https://pilotstrategy.eu/about-the-project>

<sup>14</sup> Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants

reporting, there have been five such plants in planning in Belgium, four of which plan to set aside space for a possible retrofit of carbon capture technology.

In Poland, there are eight such power plants, four of which were planned or under construction, and four of which were operational at the time of reporting. All these plants have set aside or plan to set aside a specific area for installing CO<sub>2</sub> capture facilities.

In Germany, two such power plants have received a permit since the last report. The plants became operational in 2020 and 2022, respectively, and both have set aside areas for retrofitting CO<sub>2</sub> capture facilities. In Lithuania, one such power plant has received a permit since the last report.

## **2.8. Other**

The European Commission financially supports projects for capturing 4.6 million tonnes of CO<sub>2</sub> annually and has selected several projects representing a further 5.8 million tonnes of CO<sub>2</sub> for grant agreements under the ETS Innovation Fund for permanent storage in the EEA<sup>15</sup>. Since the last implementation report, projects that have applied to the ETS Innovation Fund have planned to capture more than 20 million tonnes of CO<sub>2</sub>, underlining the urgent need and the market opportunity to develop CO<sub>2</sub> storage sites in accordance with the CCS Directive in the European Economic Area.

## **3. CONCLUSIONS**

The CCS Directive has been correctly applied across the reporting period in the EU Member States, which had submitted reports to the Commission by the end of July 2023.

Since the third implementation report in 2019, considerable progress has been reported regarding the deployment of CO<sub>2</sub> storage sites notably but not only in the North Sea region in the form of awarded (or soon to be awarded) exploration permits, which are an important step towards a storage permit.

EU Member States and Norway continue to support or plan to support in the near future, through their national programmes or funds, research and demonstration activities on CCS. Furthermore, many countries are involved in a number of European research and collaborative projects. The European Commission supports capture and storage of carbon dioxide with the ETS Innovation Fund, including full value chain projects combining capture, transport and storage.

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<sup>15</sup> [https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund/what-innovation-fund\\_en](https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund/what-innovation-fund_en)