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

## DIRECTIVE 2009/31/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 23 April 2009

on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006

(Text with EEA relevance)

## THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Economic and Social Committee<sup>(1)</sup>,

After consulting the Committee of the Regions,

Acting in accordance with the procedure laid down in Article 251 of the Treaty<sup>(2)</sup>,

## Whereas:

- (1) The ultimate objective of the United Nations Framework Convention on Climate Change, which was approved by Council Decision 94/69/EC of 15 December 1993<sup>(3)</sup>, is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
- (2) The Sixth Community Environment Action Programme established by Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002<sup>(4)</sup> identifies climate change as a priority for action. That programme recognises that the Community is committed to achieving an 8 % reduction in emissions of greenhouse gases by 2008 to 2012 compared to 1990 levels, and that, in the longer term, global emissions of greenhouse gases will need to be reduced by approximately 70 % compared to 1990 levels.
- (3) The Commission Communication of 10 January 2007 entitled 'Limiting global climate change to two degrees Celsius The way ahead for 2020 and beyond' clarifies that in the context of the envisaged global reduction of greenhouse gas emissions of 50 % by 2050, a reduction in greenhouse gas emissions of 30 % in the developed world by 2020 is required, rising to 60 %-80 % by 2050, that this reduction is technically feasible and

- the benefits far outweigh the costs, but that, to achieve it, all mitigation options must be harnessed.
- (4) Carbon dioxide capture and geological storage (CCS) is a bridging technology that will contribute to mitigating climate change. It consists of the capture of carbon dioxide (CO<sub>2</sub>) from industrial installations, its transport to a storage site and its injection into a suitable underground geological formation for the purposes of permanent storage. This technology should not serve as an incentive to increase the share of fossil fuel power plants. Its development should not lead to a reduction of efforts to support energy saving policies, renewable energies and other safe and sustainable low carbon technologies, both in research and financial terms.
- (5) Preliminary estimates, carried out with a view to assessing the impact of the Directive and referred to in the impact assessment of the Commission, indicate that seven million tonnes of CO<sub>2</sub> could be stored by 2020, and up to 160 million tonnes by 2030, assuming a 20 % reduction in greenhouse gas emissions by 2020 and provided that CCS obtains private, national and Community support and proves to be an environmentally safe technology. The CO<sub>2</sub> emissions avoided in 2030 could account for some 15 % of the reductions required in the Union.
- (6) The Second European Climate Change Programme, which was established by the Commission Communication of 9 February 2005 entitled 'Winning the Battle Against Global Climate Change' to prepare and examine future climate policy in the Community, set up a Working Group on Carbon Capture and Geological Storage. The Working Group's mandate was to explore CCS as a means of reducing climate change. The Working Group published a detailed report on the topic of regulation, which was adopted in June 2006. It stressed the need for the development of both policy and regulatory frameworks for CCS and urged the Commission to undertake further research into the subject.
- (7) The Commission Communication of 10 January 2007 entitled 'Sustainable power generation from fossil fuels: aiming for near-zero emissions from coal after 2020' reiterated the need for a regulatory framework based on an integrated risk assessment for CO<sub>2</sub> leakage, including site selection requirements designed to minimise the risk of leakage, monitoring and reporting regimes to verify storage and adequate remediation of any damage that may occur. The Communication set out an action plan for the Commission in this area during 2007, which required the development of a sound management framework for CCS, including the work on the regulatory framework, incentive framework, and support programmes, as well as external elements, for example technology cooperation with key countries on CCS.
- (8) The European Council of March 2007 also urged the Member States and the Commission to work towards strengthening research and development and developing the necessary technical, economic and regulatory framework in order to remove existing legal barriers and to bring environmentally safe CCS to deployment with new fossil power plants, if possible by 2020.

- (9) The European Council of March 2008 recalled that the objective of proposing a regulatory framework on CCS was to ensure that this novel technology would be deployed in an environmentally safe way.
- (10) The European Council of June 2008 called on the Commission to bring forward as soon as possible a mechanism to incentivise Member State and private sector investments to ensure the construction and operation by 2015 of up to 12 CCS demonstration plants.
- (11) Each of the different components of CCS, namely capture, transport and storage of CO<sub>2</sub>, has been the object of pilot projects on a smaller scale than that required for their industrial application. These components still need to be integrated into a complete CCS process, technological costs need to be reduced and more and better scientific knowledge has to be gathered. It is therefore important that Community efforts on CCS demonstration within an integrated policy framework start as soon as possible, including, in particular, a legal framework for the environmentally safe application of CO<sub>2</sub> storage, incentives, notably for further research and development, efforts by means of demonstration projects, and public awareness measures.
- (12) At the international level, legal barriers to the geological storage of CO<sub>2</sub> in geological formations under the seabed have been removed through the adoption of related risk management frameworks under the 1996 London Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1996 London Protocol) and under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention).
- (13) In 2006, the Contracting Parties to the 1996 London Protocol adopted amendments to the Protocol. These amendments allow and regulate the storage of CO<sub>2</sub> streams from CO<sub>2</sub> capture processes in geological formations under the seabed.
- (14) The Contracting Parties to the OSPAR Convention in 2007 adopted amendments to the Annexes to the Convention to allow the storage of CO<sub>2</sub> in geological formations under the seabed, a Decision to ensure environmentally safe storage of CO<sub>2</sub> streams in geological formations, and OSPAR Guidelines for Risk Assessment and Management of that activity. They also adopted a Decision to prohibit placement of CO<sub>2</sub> into the water-column of the sea and on the seabed, because of the potential negative effects.
- (15) At Community level, a number of legislative instruments are already in place to manage some of the environmental risks of CCS, in particular regarding capture and transport of CO<sub>2</sub>, and they should be used where possible.
- (16) Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control<sup>(5)</sup> is suitable for regulating, in respect of certain industrial activities, the risks of CO<sub>2</sub> capture to the environment and human health and, as a result, should be applied to the capture of CO<sub>2</sub> streams for the purposes of geological storage from installations covered by that Directive.
- (17) Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment<sup>(6)</sup> should be applied to the capture

- and transport of CO<sub>2</sub> streams for the purposes of geological storage. It should also apply to storage sites pursuant to this Directive.
- of the Member States, in their exclusive economic zones and on their continental shelves. The Directive should not apply to projects with a total intended storage below 100 kilotonnes, undertaken for research, development or testing of new products and processes. This threshold would also seem appropriate for the purposes of other relevant Community legislation. The storage of CO<sub>2</sub> in storage complexes extending beyond the territorial scope of this Directive and the storage of CO<sub>2</sub> in the water column should not be permitted.
- (19)Member States should retain the right to determine the areas within their territory from which storage sites may be selected. This includes the right of Member States not to allow any storage in parts or on the whole of their territory, or to give priority to any other use of the underground, such as exploration, production and storage of hydrocarbons or geothermal use of aquifers. In this context, Member States should in particular give due consideration to other energy-related options for the use of a potential storage site, including options which are strategic for the security of the Member State's energy supply or for the development of renewable sources of energy. The selection of the appropriate storage site is crucial to ensure that the stored CO<sub>2</sub> will be completely and permanently contained. Member States should, in selecting storage sites, take account of their geological characteristics, for example seismicity, in the most objective and effective way possible. A site should therefore only be selected as a storage site, if there is no significant risk of leakage, and if in any case no significant environmental or health impacts are likely to occur. This should be determined through a characterisation and assessment of a potential storage complex pursuant to specific requirements.
- Enhanced Hydrocarbon Recovery (EHR) refers to the recovery of hydrocarbons in addition to those extracted by water injection or other means. EHR is not in itself included in the scope of this Directive. However, where EHR is combined with geological storage of CO<sub>2</sub>, the provisions of this Directive for the environmentally safe storage of CO<sub>2</sub> should apply. In that case, the provisions of this Directive concerning leakage are not intended to apply to quantities of CO<sub>2</sub> released from surface installations which do not exceed what is necessary in the normal process of extraction of hydrocarbons, and which do not compromise the security of the geological storage or adversely affect the surrounding environment. Such releases are covered by the inclusion of storage sites in 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<sup>(7)</sup>, which requires surrender of emissions trading allowances for any leaked emissions.
- (21) Member States should make available to the public environmental information relating to geological storage of CO<sub>2</sub> in accordance with applicable Community legislation.
- (22) Member States which intend to allow geological storage of CO<sub>2</sub> in their territory should undertake an assessment of the storage capacity available within their territory. The

Commission should organise an exchange of information and best practices between those Member States, in the context of the exchange of information provided for in this Directive.

- (23) Member States should determine in which cases exploration is required to generate the information necessary for the site selection. Exploration, that is activities intruding into the subsurface, should be made subject to a permit requirement. Member States do not need to set admission criteria for procedures for granting exploration permits, but where they do, they should at least ensure that the procedures for the granting of exploration permits are open to all entities possessing the necessary capacities. Member States should also ensure that the permits are granted on the basis of objective, published and non-discriminatory criteria. In order to protect and encourage exploration investments, exploration permits should be granted for a limited volume area and for a limited time during which the holder of the permit should have the sole right to explore the potential CO<sub>2</sub> storage complex. Member States should ensure that no conflicting uses of the complex are permitted during this time. If no activities are carried out within a reasonable time, Member States should ensure that the exploration permit is withdrawn and can be granted to other entities.
- (24) Storage sites should not be operated without a storage permit. The storage permit should be the core instrument to ensure that the substantial requirements of this Directive are met and that geological storage therefore takes place in an environmentally safe way. In the granting of the storage permit, priority should be given to the holder of the exploration permit over competitors, as the former will generally have made substantial investments.
- In the early phase of the implementation of this Directive, to ensure consistency in implementation of the requirements of this Directive across the Community, all storage permit applications should be made available to the Commission after receipt. The draft storage permits should be transmitted to the Commission to enable it to issue an opinion on the draft permits within four months of their receipt. The national authorities should take this opinion into consideration when taking a decision on the permit and should justify any departure from the Commission's opinion. The review at Community level should also help to enhance public confidence in CCS.
- (26) The competent authority should review and where necessary update or withdraw the storage permit if, inter alia, it has been notified of leakages or significant irregularities, if the reports submitted by the operators or the inspections carried out show non-compliance with permit conditions or if it is made aware of any other failure by the operator to comply with the permit conditions. After the withdrawal of a permit, the competent authority should either issue a new permit or close the storage site. In the meantime, the competent authority should take over the responsibility for the storage site, including specific legal obligations. Costs incurred should be recovered from the former operator.
- (27) It is necessary to impose on the composition of the CO<sub>2</sub> stream constraints that are consistent with the primary purpose of geological storage, which is to isolate CO<sub>2</sub> emissions from the atmosphere, and that are based on the risks that contamination

may pose to the safety and security of the transport and storage network and to the environment and human health. To this end, the composition of the CO<sub>2</sub> stream should be verified prior to injection and storage. The composition of the CO<sub>2</sub> stream is the result of the processes at the capture installations. Following inclusion of capture installations in Directive 85/337/EEC, an environmental impact assessment has to be carried out in the capture permit process. Inclusion of capture installations in Directive 2008/1/EC further ensures that best available techniques to improve the composition of the CO<sub>2</sub> stream have to be established and applied. In addition, in accordance with this Directive, the operator of the storage site should only accept and inject CO<sub>2</sub> streams if an analysis of the composition, including corrosive substances, of the streams, and a risk assessment have been carried out, and if the risk assessment has shown that the contamination levels of the CO<sub>2</sub> stream are in line with the composition criteria referred to in this Directive.

- Monitoring is essential to assess whether injected CO<sub>2</sub> is behaving as expected, whether any migration or leakage occurs, and whether any identified leakage is damaging the environment or human health. To that end, Member States should ensure that during the operational phase, the operator monitors the storage complex and the injection facilities on the basis of a monitoring plan designed pursuant to specific monitoring requirements. The plan should be submitted to and approved by the competent authority. In the case of geological storage under the seabed, monitoring should further be adapted to the specific conditions for the management of CCS in the marine environment.
- (29) The operator should report, inter alia, the results of the monitoring to the competent authority at least once a year. In addition, Member States should establish a system of inspections to ensure that the storage site is operated in compliance with the requirements of this Directive.
- (30)Provisions are required concerning liability for damage to the local environment and the climate, resulting from any failure of permanent containment of CO<sub>2</sub>. Liability for environmental damage (damage to protected species and natural habitats, water and land) is regulated by 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<sup>(8)</sup>, which should be applied to the operation of storage sites pursuant to this Directive. Liability for climate damage as a result of leakages is covered by the inclusion of storage sites in Directive 2003/87/EC, which requires surrender of emissions trading allowances for any leaked emissions. In addition, this Directive should establish the obligation on the operator of the storage site to take corrective measures in case of leakages or significant irregularities on the basis of a corrective measures plan submitted to and approved by the competent national authority. Where the operator fails to take the necessary corrective measures, these measures should be taken by the competent authority, which should recover the costs from the operator.
- (31) A storage site should be closed if the relevant conditions stated in the permit have been complied with, upon request from the operator after authorisation of the competent

- authority, or if the competent authority so decides after the withdrawal of a storage permit.
- (32) After a storage site has been closed, the operator should remain responsible for maintenance, monitoring and control, reporting, and corrective measures pursuant to the requirements of this Directive on the basis of a post-closure plan submitted to and approved by the competent authority as well as for all ensuing obligations under other relevant Community legislation until the responsibility for the storage site is transferred to the competent authority.
- (33) The responsibility for the storage site, including specific legal obligations, should be transferred to the competent authority, if and when all available evidence indicates that the stored CO<sub>2</sub> will be completely and permanently contained. To this end, the operator should submit a report to the competent authority for approval of the transfer. In the early phase of the implementation of this Directive, to ensure consistency in implementation of the requirements of this Directive across the Community, all reports should be made available to the Commission after receipt. The draft approval decisions should be transmitted to the Commission to enable it to issue an opinion on the draft approval decisions within four months of their receipt. The national authorities should take this opinion into consideration when taking a decision on the approval and should justify any departure from the Commission's opinion. The review of draft approval decisions should, in the same way as the review of draft storage permits at Community level, also help to enhance public confidence in CCS.
- (34) Liabilities other than those covered by this Directive, Directive 2003/87/EC and Directive 2004/35/EC, in particular concerning the injection phase, the closure of the storage site and the period after transfer of legal obligations to the competent authority, should be dealt with at national level.
- (35) After the transfer of responsibility, monitoring should be reduced to a level which still allows for identification of leakages or significant irregularities, but should again be intensified if leakages or significant irregularities are identified. There should be no recovery of costs incurred by the competent authority from the former operator after the transfer of responsibility except in the case of fault on the part of the operator prior to the transfer of responsibility for the storage site.
- (36) Financial provision should be made in order to ensure that closure and post-closure obligations, obligations arising from inclusion under Directive 2003/87/EC, and obligations under this Directive to take corrective measures in case of leakages or significant irregularities, can be met. Member States should ensure that financial provision, by way of financial security or any other equivalent, is made by the potential operator so that it is valid and effective before commencement of injection.
- (37) National authorities may, after transfer of responsibility, have to bear costs, such as monitoring costs, associated with CO<sub>2</sub> storage. A financial contribution should therefore be made available by the operator to the competent authority, before the transfer of responsibility takes place and on the basis of arrangements to be decided by Member States. This financial contribution should at least cover the anticipated cost of monitoring for a period of 30 years. The level of the financial contribution should

- be determined on the basis of guidelines to be adopted by the Commission to help ensure consistency in implementation of the requirements of this Directive across the Community.
- (38) Access to CO<sub>2</sub> transport networks and storage sites, irrespective of the geographical location of potential users within the Union, could become a condition for entry into or competitive operation within the internal electricity and heat market, depending on the relative prices of carbon and CCS. It is therefore appropriate to make arrangements for potential users to obtain such access. This should be done in a manner to be determined by each Member State, applying the objectives of fair, open and non-discriminatory access and taking into account, inter alia, the transport and storage capacity which is available or can reasonably be made available as well as the proportion of its CO<sub>2</sub> reduction obligations pursuant to international legal instruments and to Community legislation intended to be met through CCS. Pipelines for CO<sub>2</sub> transport should, where possible, be designed so as to facilitate access of CO<sub>2</sub> streams meeting reasonable minimum composition thresholds. Member States should also establish dispute settlement mechanisms to enable expeditious settlement of disputes regarding access to transport networks and storage sites.
- (39) Provisions are required to ensure that, in cases of transboundary CO<sub>2</sub> transport, transboundary storage sites or transboundary storage complexes, the competent authorities of the Member States concerned meet jointly the requirements of this Directive and of all other Community legislation.
- (40) The competent authority should establish and maintain a register of the storage permits granted and of all closed storage sites and surrounding storage complexes, including maps of their spatial extent to be taken into consideration by the competent national authorities in relevant planning and permitting procedures. The register should also be reported to the Commission.
- (41) Member States should submit reports on the implementation of this Directive on the basis of questionnaires drawn up by the Commission pursuant to Council Directive 91/692/EEC of 23 December 1991 standardising and rationalising reports on the implementation of certain Directives relating to the environment<sup>(9)</sup>.
- (42) Member States should lay down rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive. Those penalties should be effective, proportionate and dissuasive.
- (43) The measures necessary for the implementation of this Directive should be adopted in accordance with Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission<sup>(10)</sup>.
- In particular the Commission should be empowered to amend the Annexes. Since those measures are of general scope and are designed to amend non-essential elements of this Directive, they must be adopted in accordance with the regulatory procedure with scrutiny provided for in Article 5a of Decision 1999/468/EC.
- (45) Directive 85/337/EEC should be amended to cover capture and transport of CO<sub>2</sub> streams for the purposes of geological storage as well as storage sites pursuant to

- this Directive. Directive 2004/35/EC should be amended to cover the operation of storage sites pursuant to this Directive. Directive 2008/1/EC should be amended to cover capture of  $CO_2$  streams for the purposes of geological storage from installations covered by that Directive.
- (46) The adoption of this Directive should ensure a high level of protection of the environment and human health from the risks posed by the geological storage of CO<sub>2</sub>. For this reason, Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste<sup>(11)</sup> and Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste<sup>(12)</sup> should be amended so as to exclude CO<sub>2</sub> captured and transported for the purposes of geological storage from the scope of application of those instruments. 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<sup>(13)</sup> should also be amended to allow for injection of CO<sub>2</sub> into saline aquifers for the purposes of geological storage. Any such injection is subject to the provisions of Community legislation on the protection of groundwater, and must be in accordance with Article 4(1)(b) of Directive 2000/60/EC and with Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration<sup>(14)</sup>.
- (47)The transition to low-carbon power generation requires that, in the case of fossil fuel power generation, new investments be made in such a way as to facilitate substantial reductions in emissions. To this end, 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 (15) should be amended to require that all combustion plants of a specified capacity, for which the original construction licence or the original operating licence is granted after the entry into force of this Directive, have suitable space on the installation site for the equipment necessary to capture and compress CO<sub>2</sub> if suitable storage sites are available, and if CO<sub>2</sub> transport and retrofitting for CO<sub>2</sub> capture are technically and economically feasible. The economic feasibility of the transport and retrofitting should be assessed taking into account the anticipated costs of avoided CO<sub>2</sub> for the particular local conditions in the case of retrofitting and the anticipated costs of CO<sub>2</sub> allowances in the Community. The projections should be based on the latest evidence; a review of technical options and an analysis of uncertainties in the assessment processes should also be undertaken. The competent authority should determine whether these conditions are met on the basis of an assessment made by the operator and other available information, particularly concerning the protection of the environment and human health.
- (48) The Commission should, by 30 June 2015, conduct a review of this Directive in the light of the experience gained in the early phase of its implementation and make proposals for its revision as appropriate.
- (49) Since the objective of this Directive, namely the establishment of a legal framework for the environmentally safe storage of CO<sub>2</sub>, cannot be sufficiently achieved by the Member States acting individually, and can therefore, by reason of its scale and effects, be better achieved at Community level, the Community may adopt measures in accordance with

- the principle of subsidiarity as set out in Article 5 of the Treaty. In accordance with the principle of proportionality, as set out in that Article, this Directive does not go beyond what is necessary in order to achieve that objective.
- (50) In accordance with point 34 of the Interinstitutional agreement on better law-making<sup>(16)</sup>, Member States are encouraged to draw up, for themselves and in the interest of the Community, their own tables, which will, as far as possible, illustrate the correlation between this Directive and the transposition measures and to make them public.
- (51) The application of this Directive is without prejudice to Articles 87 and 88 of the Treaty, HAVE ADOPTED THIS DIRECTIVE:

- (1) OJ C 27, 3.2.2009, p. 75.
- (2) Opinion of the European Parliament of 17 December 2008 (not yet published in the Official Journal) and Council Decision of 6 April 2009.
- (**3**) OJ L 33, 7.2.1994, p. 11.
- (4) OJ L 242, 10.9.2002, p. 1.
- (**5**) OJ L 24, 29.1.2008, p. 8.
- (6) OJ L 175, 5.7.1985, p. 40.
- (7) OJ L 275, 25.10.2003, p. 32.
- **(8)** OJ L 143, 30.4.2004, p. 56.
- (9) OJ L 377, 31.12.1991, p. 48.
- (10) OJ L 184, 17.7.1999, p. 23.
- (11) OJ L 114, 27.4.2006, p. 9. Directive 2006/12/EC is repealed by 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) with effect from 12 December 2010.
- (12) OJ L 190, 12.7.2006, p. 1.
- (13) OJ L 327, 22.12.2000, p. 1.
- (14) OJ L 372, 27.12.2006, p. 19.
- (15) OJ L 309, 27.11.2001, p. 1.
- (16) OJ C 321, 31.12.2003, p. 1.