Report by Germany on Implementation of Directive 2009/31/EC on the geological storage of carbon dioxide ("CCS Directive")

Changes, reviews and updates of national implementation legislation

1. Are there any changes to national legislation, permitting system or competent authorities that have taken place since the last report on implementation of the CCS Directive in your country?

No, there have been neither changes to national legislation, permitting system nor competent authorities in Germany since the last report on implementation of the CCS Directive in 2019. Based on finding of the second evaluation report on the national CCS-Law (Kohlendioxid Speicherungsgesetz - KSpG) published by the Federal Government in the end of 2022, the Federal Government made suggestions to the parliament to change the national CCS-Law in order to enable timely and efficient planning, approval and construction of the necessary pipeline/CO2-transport infrastructure. The Federal Government has also suggested to ratify the change to the London Protocol to allow the export of CO2 for the purpose of onshore storage.

2. Are there processes in place for storage permit applicants to engage pro-actively with the competent permitting authorities regarding relevant applications? If yes, please provide details.

No, there are no processes in place for storage permit applicants pro-active engagement with the competent permitting authorities regarding relevant applications in Germany at the moment.

3. Please provide the name, email address and telephone of the contact point at the competent authority responsible for fulfilling the duties established under the Directive.

Based on Article 39 of the German CCS-Law individual federal German states (Bundesländer) are the competent authority responsible for fulfilling the duties established under the Directive. But as the deadline for applications on CO2 storage ended December 31st 2016, and the German CCS-Law is currently under revision it is considered unnecessary to name contact points at the federal German state level.
At the federal level, the Federal Ministry of Economic Affairs and Climate Action (BMWK) is the contact point for fulfilling the duties established under the Directive:

Division IV E 2, BMWK
Email: buero-ive2@bmwk.bund.de
Telephone: +49-(30)-18-615-6416

4. Are there any issues that the competent authority would like to discuss with other competent authorities in relation to the practical implementation of the Directive and in particular the national permitting procedures in the Information Exchange Group under the auspices of Article 27(2)?

No, at the moment there are no issues that the German competent authority would like to discuss with other competent authorities in relation to the practical implementation of the Directive.

Selection of areas for storage sites (Article 4)

5. Which areas are determined from which storage sites may be selected pursuant to Article 4(1) until April 2023?

Until today there are no concrete areas determined in Germany from which storage sites may be selected pursuant to Article 4(1) until April 2023. As stated in the German CCS-Law, the federal German states (Bundesländer) may stipulate that the testing and demonstration

of permanent storage shall only be permitted in certain areas or that it shall not be permitted in certain areas.

6. Will additional areas be determined from which storage sites may be selected in the period until the next report at the end of 2027, if so, which geological type of areas are considered (e.g, saline aquifers, depleted or not depleted gas & oil fields, mafic rocks) from a geological point of view and what are the next steps?

There is no process to determine such areas in Germany at this stage. This question has yet to be assessed based on results and recommendations of the German carbon management strategy that will be developed and presented by the Federal Government in 2023. The strategy is intended to identify possible areas of application for CCU and CCS as well as the legal and economic framework conditions for a successful ramp-up, including the creation of the necessary infrastructure. This also includes reviewing potential areas for CO2 storage in Germany, and potential storage capacities, respectively.

Member States are not obliged to justify any such decision, but an indication which territories are concerned, including their location, and why this has been done, would be appreciated.

7. Are there information about environmental and/or health risks relating to the geological storage of CO_2 in accordance with the applicable Community legislation available to the public[3]?

No, there are no information about environmental and/or health risks relating to the geological storage of CO2 in accordance with the applicable Community legislation available. The only site to test and demonstrate CO2 storage in Germany was Ketzin. Up until today, no environmental and/or health risks relating to the geological storage of CO2 at Ketzin have been reported.

Exploration permits (Article 5)

8. Are there areas or specific sites where no exploration permits are required to generate the information necessary for the selection of storage sites, pursuant to Article 5?

No.

9. How many exploration permits have been given pursuant to Article 5 since your last reporting?

None.

Storage permits applications (Article 10)

10. Member States shall make the permit applications available to the Commission within one month after receipt. Are there any plans of potential operators to apply for storage permits pursuant to Article 7? If yes, please provide an approximate timing.

None.

Third-party fair and open access (Article 21)

11. What measures – if any – have been taken to ensure that potential users are able to obtain fair and open access to transport networks and to storage sites for the purposes of geological storage of the produced and captured CO_2 (Article 21)

Article 33-35 of the German CCS-Law delineates how it has to be ensured that potential users are able to obtain fair and open access to transport networks and to storage sites for the purposes of geological CO2 storage of the produced and captured CO2 in accordance to the “CCS Directive”.

12. Are you aware that prospective transport operators and/or storage operators have refused access to their facilities on the grounds of lack of capacity?

No.

13. What measures – if any – have been taken to ensure that the operator refusing access on the grounds of lack of capacity or a lack of connection makes any necessary enhancements as far as it is economic to do so or when a potential customer is willing to pay for them? (Article 21)

According to Article 33 of the German CCS Law the operators of carbon dioxide pipeline networks and carbon dioxide storage facilities can refuse the connection and access if they can prove that the granting of the connection and access is not possible or unreasonable for them due to a lack of capacity or compelling legal reasons. The refusal must be justified in writing and sent to the applicant party and the Federal Network Agency (Bundesnetzagentur). At the request of the requesting party, the justification for insufficient capacity or lack of connection options must also contain meaningful information about which specific measures and associated costs for the expansion of the carbon dioxide pipeline network would be required in detail in order to carry out the connection or access. If operators of carbon dioxide pipeline networks make the connection or access refuse for reasons of capacity, they are obliged to carry out the necessary expansion measures, insofar as this is the case this is economically reasonable for them or the party requesting connection or access bears the costs of these measures and these measures do not affect the safety of carbon dioxide transport and storage.

Transboundary cooperation (Article 24)

14. Is there any experience or plans for transboundary CO_2 transport or CO_2 storage sites or storage complexes? Please provide details on the status of preparations, if any.

No, there is neither experience or plans for transboundary CO2 transport, nor for CO2 storage sites or storage complexes in Germany. We are currently discussing the suggested ratification of the change to the Art. 6 London Protocol to allow the export of CO2 for the purpose of onshore storage.

CO2 capture readiness (Article 33)

15. How many combustion plants with a rated electrical output of 300 MW or more have received a permit since the last implementation report? What was the outcome of the assessment under Article 36 of Directive 2010/75/EU? In case of negative assessment, have the combustion plants set aside suitable space irrespectively? Please provide detail for each permit according to Annex 2.

There are two combustion plants with a related electrical output of 300 MW and more which have received a permit since the last implementation report:

Datteln 4, a hard coal fired power plant with a net nominal power of 1.052 MW has gone into operation in 2020. And a natural gas fired combined cycle gas turbine in Herne with a net nominal power of 657 MW has gone into operation in 2022.
At present there is no large-scale CO2 storage facility available in Germany. Consequently, the use of a process that has not yet been tested at national level on a large scale is also considered economically unreasonable. As a precautionary measure, for both power plants, areas were designated for the retrofitting of a CO2 capture plant.

Further questions

16. What other national programmes are in place or planned to support research, demonstration and deployment of CCS?

The research mission “Marine carbon sinks in decarbonisation pathways” (CDRmare) investigates in six collaborative projects in which way and to what extent the ocean can play

a sustainable role in the removal and storage of CO2 from the atmosphere. CDRmare is funded by the German Federal Ministry of Education and Research (BMBF) with 27 million euros over an initial phase (08/2021 – 07/2024) of three years, the second phase (08/2024 – 07/2027) will focus on implementation of certain CDR measures.

In the research program CDRterra, land-based CDR methods will be researched and evaluated in an integrated manner, and suitable policy instruments will be developed and evaluated by involving the public and stakeholders from civil society. The German Federal Ministry of Education and Research (BMBF) funds ten research projects within CDRterra with 21 million euros (2021-2024). While CCS is not a focus of the research program, CCS does play a role in some projects for the aspect of permanent storage of certain CDR methods:

The project CDRSynTra will bring together all findings from the single projects. This will also include scenarios with integrated modelling systems in which CCS is included both as an industry decarbonization option and as part of CDR methods. Within the DAC-TALES project, a comprehensive analysis of the full range of Direct Air Capture (DAC) technologies is compiled. The findings are combined into flexible models of DAC and storage of captured CO2 (CCS) in the framework of the overall energy system.

Phase II of CDRterra is currently being planned.

Also, the 7th Energy Research Programme "Innovation for the Energy Transition" is in place. The programme contains the guidelines for energy research funding over the coming years starting in 2018. The Federal Government provides around €1.3 billion annually under the 7th Energy Research Programme for the research, development, demonstration and testing of forward-looking technologies and concepts. The programme is managed by the Federal Ministry for Economic Affairs and Climate Action and implemented together with the Federal Ministry of Education and Research (BMBF) and the Federal Ministry of Food and Agriculture (BMEL).

The funding programme "Decarbonisation of Industry" (January 2021 - June 2024) is managed by the Federal Ministry for Economic Affairs and Climate Action (BMWK). The programme funds research, development and investment projects with a view to GHG neutrality in the industrial sector. Within this programme projects in the area of energy-intensive industries will be funded that plan to reduce or completely avoid hard-to-abate or unavoidable GHG emissions.

17. Are there any ongoing national or European research projects that may have relevance to the Directive?

National funding/co-funding:

Geological CO_2 storage

- Research mission CDRmare – Marine carbon sinks in decarbonisation pathways (2021-2024)/ Projects: GEOSTOR – Submarine carbon dioxide storage in geological formations of the German North Sea, (AIMS^3– Alternate scenarios, innovative technologies, and monitoring approaches for sub-seabed storage of carbon dioxide)
- CDRterra – Research programme on land-based CO_2 removal (CDR) methods (2021-2024)/ e.g., projects: DAC-TALES - Transdisciplinary Assessment Combining Labs, the Environment, the Economy, and Society, BioNet – Multi-stage assessment of biobased negative emission technologies

CCS – various aspects:

- ACT –Accelerating CCS technologies as a new low-carbon energy vector (ERA-Net Co-fund; 2016-2021); continued with national funding only to fund various projects and topics (

Fundamental geological data/subsurface 3D modelling
- TUNB – Potenziale des unterirdischen Speicher- und Wirtschaftsraumes im Norddeutschen Becken (2014-2021)
- TUNB Velo2.0 – Potenziale des unterirdischen Speicher- und Wirtschaftsraums im Norddeutschen Becken (NB) - Velocity: Parametrisierung 3D-Modell (2021-2025)

Integration of information and knowledge on subsurface energy, water and raw material resource, not directly addressing CO_2 storage:
- GeoERA – Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe (ERA-NET Co-Fund Action; 2018-2022)
- GSEU – A Geological Service for Europe (2022-2027)

Note: The focus of national research funding has been on CCU.

EU funding (projects with German participant(s)):

CO_2 from industrial and geothermal sources
- CEEGS – Novel CO2-base electrothermal energy and geological storage system (2022-2025)
- ACCESS – Providing access to cost-efficient, replicable, safe and flexible CCUS (2021-2025)
- LEILAC2 – Low emissions intensity lime and cement 2: Demonstration scale (2020-2025)
- C4U – Advanced Carbon Capture for steel industries integrated in CCUS Clusters (2020-2024)
- 3D DMX Demonstration in Dunkirk (2019-2023)
- GECO – Geothermal Emission Control (2018-2023)
- CLEANKER – Clean clinker production by Calcium looping process (2017-2023)
- German institutions have also been participating in research activities funded by the Research Fund for Coal and Steel (RFCS).

CO_2 storage pilots and infrastructure planning
- PilotStrategy – CO_2 Geological Pilots in Strategic Territories (2021-2026)
- STRATEGY CCUS – Strategic planning of regions and territories in Europe for low-carbon energy and industry through CCUS (2019-2022)
- ENOS – Enabling onshore CO_2 storage in Europe (2016-2020)

Monitoring
- SECURe – Subsurface evaluation of carbon capture and storage and unconventional risk (2018-2021)
- S4CE – Science for clean energy (2017-2020)
- STEMM-CCS – Strategies for environmental monitoring of marine carbon capture and storage (2016-2020)

18. Are there other plans to support further appraisal of CO_2 storage sites, to prepare for CO_2 transport infrastructure or for CO_2 hubs and clusters?

Based on the results and recommendations of the second evaluations report on the national CCS-Law published end of 2022, the German Federal Government has announced the development of a carbon management strategy, which it will present in 2023. The strategy is intended to identify possible areas of application for CCU and CCS as well as the legal and economic framework conditions for a successful ramp-up of CCU/CCS industry, including the development of necessary transport infrastructure. The CMS will focus primarily on process emissions from industry and the waste incineration that are difficult to avoid or unavoidable.

In this context, we will also establish a dialogue with partner countries regarding the implementation of CCS.