

Questions and Answers on the directive on the geological storage of carbon dioxide

Why the need for CCS?

While energy efficiency and renewables are in the long term the most sustainable solutions both for security of supply and climate, global greenhouse gas emissions cannot be reduced by at least 50% by 2050, as they need to be, if we do not also use other options such as carbon capture and storage.

Timing is crucial. About a third of existing coal-fired power capacity in Europe will be replaced within the next 10 years. Internationally, the energy consumption of China, India, Brazil, South Africa and Mexico will lead to a major global demand increase, which is likely to be met in large part from fossil fuels. The capacity to deal with these very substantial potential emissions must urgently be developed.

How much will carbon capture and storage cost?

The cost of CCS involves partly capital investment on equipment to capture, transport and store CO₂, and partly the cost of operating this equipment to store the CO₂ in practice, such as the amount of energy required to capture, transport and inject the CO₂. At current technology prices, up-front investment costs are about 30 to 70 % (i.e. several hundred million euros per plant) greater than for standard plants and operating costs are currently 25 to 75% greater than in non-CCS coal-fired plants. These costs are expected to substantially decrease as the technology is proven on a commercial scale.

When will widespread deployment happen?

Uptake of CCS will depend on the carbon price and the price of the technology. If the price per tonne of CO₂ avoided by CCS is lower than the carbon price, then CCS will begin to be deployed. Although both of these prices remain highly uncertain, the EU climate and energy package will serve to stabilise them to some extent.

The EU Emissions Trading System will recognise CO₂ captured, transported and safely stored as not having been emitted. The revision to the system to implement the trading sector's share of the European Union's 20% GHG reduction target should ensure a robust carbon price.

The Communication on Supporting Early Demonstration of Sustainable Power Generation of 23 January 2008 sets out the Commission's commitment to early effective demonstration of CCS and calls for timely and bold industry and public initiatives. The aim of demonstration is to learn from practical integration of the process components on a commercial scale. The enabling legal framework will apply to demonstration projects and all other future CCS projects. With demonstration projects in place, the price of the technology should decrease substantially over the next 10 years.

According to the Commission's projections, as set out in the Impact Assessment of the proposal for a directive on the geological storage of carbon dioxide, the uptake of CCS on a commercial scale is likely to begin some time around 2020 and increase substantially after that.

Who will bear the cost?

The proposal to enable CCS will not impose additional costs over and above those required to meet the 20% greenhouse gas reduction target. Once CCS is mature, it will be for individual operators to decide whether to release emissions and pay ETS allowances to cover them or use CCS to reduce their emissions and their ETS liabilities. The maximum an operator will pay will be largely set by the carbon price: CCS will only be deployed if the cost per tonne of CO₂ avoided is lower than the carbon price. In this respect the carbon price internalises the climate cost of CO₂ emissions. Depending on the conditions in the market in question, operators may pass on a portion of the carbon cost to consumers. (See MEMOs on effort sharing and revised ETS proposal)

In the early phase, CCS demonstration projects will require additional finance on top of the incentive provided by the carbon market because the current cost of the technology is substantially higher than the carbon price. To catalyse this additional finance, decisive financial commitment from industry will be crucial and Member State support measures are also likely to play a major role.

In view of the importance of early demonstration of CCS in power generation and given that a number of those projects may require some public funding, the Commission is ready to view favourably the use of state aid for covering the additional costs related to CCS demonstration in power generation projects. This commitment is reflected in the revised Environmental State Aid Guidelines adopted on 23 January 2008.

The amended Emission Trading Directive foresees that Member States should use at least 50% of their auctioning revenues to finance the fight against climate change, including the environmentally safe capture and geological storage of CO₂. In addition, up to 300 million allowances in the new entrants reserve of the revised EU ETS will be made available for the construction and operation of up to 12 commercial demonstration projects for the environmentally safe capture and geological storage of CO₂ and innovative renewable energy technologies in the EU.

Will CCS be made mandatory?

Not at this stage. The directive enables carbon capture and storage by providing a framework to manage environmental risks and remove barriers in existing legislation. Whether CCS is taken up in practice will be determined by the carbon price and the cost of the technology. It will be up to each operator to decide whether it makes commercial sense to deploy CCS.

To avoid a lock-in of technology, Member States have to ensure that operators of all combustion plants with a rated electrical output of 300 megawatts or more for which the construction licence is granted after entry into force of the directive, have assessed whether 1) suitable storage sites are available, 2) transport facilities are technically and economically feasible and 3) it is technically and economically feasible to retrofit for CO₂ capture (so-called capture-ready assessment). Where the assessment shows that these conditions are met, suitable space for the equipment necessary to capture and compress CO₂ has to be set aside on the installation site.

This situation may evolve, however. To meet GHG reductions beyond 2020, the deployment of CCS will be essential, and by 2015 the technological options will be clearer. Where

environmentally safe CCS, as well as its economic feasibility, have been sufficiently demonstrated, the review of the directive in 2015 will examine whether it is needed and practicable to establish mandatory requirements for emission performance standards for new large combustion installations generating electricity.

How will CCS be treated under the EU Emissions Trading System?

The ETS will provide the main incentive for CCS deployment. CO₂ captured and safely stored according to the EU legal framework will be considered as not emitted under the ETS. In Phase II of the ETS (2008-12) CCS installations can be opted in. For Phase III (2013 onwards), under the amended Emissions Trading Directive, capture, transport and storage installations will be explicitly included in the ETS.

How much will CCS contribute to reducing CO₂ emissions in the EU?

The precise contribution will depend on the uptake of CCS. However, projections made for the Impact Assessment of the Commission's proposal for the directive show that, with CCS enabled under the ETS and assuming a 20% GHG reduction by 2020 and further significant progress towards our mid-century objective by 2030, 7 million tonnes of CO₂ could be captured in 2020, rising to around 160 Mt in 2030. The CO₂ avoided in 2030 would represent around 15% of the reduction required in Europe. Estimates for the potential global contribution are similar, in the order of 14% by 2030.

What type of sites will be selected and how?

There are two main kinds of geological formation that can be used for CO₂ storage: depleted oil and gas fields, and saline aquifers (groundwater bodies whose salt content makes them unsuitable for drinking water or agriculture).

Site selection is the crucial stage in designing a storage project. Member States have the right to determine which areas of their territory are free to be used for CO₂ storage. Where exploration is required to generate the necessary information, exploration permits must be issued on a non-discriminatory basis, valid for 2 years with the possibility of extension.

A detailed analysis of the potential site must be carried out according to criteria specified in Annex I of the directive, including modelling of the expected behaviour of CO₂ following injection. The site can be used only if this analysis shows that under the proposed conditions of use there is no significant risk of leakage, and that no significant health or environmental impacts are likely to occur.

The initial analysis of the site is done by the potential operator, who then submits the documentation to the Member State competent authority in the permit application. The competent authority reviews the information and if it is satisfied that the condition is met, issues a draft permit decision.

For the early storage projects the directive includes an additional safeguard. To ensure consistent application of the directive across Europe and promote public confidence in carbon capture and storage the draft permits may be reviewed by the Commission with the assistance of a scientific panel of technical experts. The Commission's opinion will be public, but the

final permitting decision remains with the national competent authority according to the subsidiarity principle.

Will storage be allowed outside the EU?

The directive can only regulate storage within the European Union and (if it is incorporated into the EEA Agreement, as the Commission expects), the European Economic Area. CO₂ stored in these regions in accordance with the directive will be considered as not having been emitted under the ETS. Storing CO₂ emissions outside the European Union is not banned, but any emissions so stored will receive no credit under the ETS, thus providing little incentive to store carbon dioxide abroad.

What is the risk of leakage? What will happen if a site leaks CO₂?

The risk of leakage will depend very much on the site in question. The IPCC Special Report on CCS concluded that:

'observations...suggest that the fraction [of CO₂] retained in appropriately selected and managed geological reservoirs is very likely to exceed 99% over 100 years and likely to exceed 99% over 1000 years.'

The key issue is thus the appropriate selection and management of sites. The requirements on site selection are designed to ensure that only sites with a minimal risk of leakage are chosen. The review of draft permit decisions by the Commission – assisted by an independent scientific panel – will provide additional confidence that the requirements will be implemented consistently across the EU.

A monitoring plan must be set up to verify that the injected CO₂ is behaving as expected. If, despite the precautions taken in selecting a site, it does leak in practice, corrective measures must be taken to rectify the situation and return the site to a safe state. Emissions Trading Allowances must be surrendered for any leaked CO₂, to compensate for the fact that the stored emissions were credited under the ETS as not emitted when they left the source. Finally, the requirements of the Environmental Liability Directive on repairing local damage to the environment will apply in the case of leakage.

Who will be responsible for inspecting CO₂ storage sites?

The competent authority in Member States must ensure that inspections are carried out to verify that the provisions of the directive are observed. Routine inspections must be carried out at least once a year, involving examination of the injection and monitoring facilities and the full range of environmental effects from the storage complex. In addition, non-routine inspections must be carried out if any leakage has been notified, if the operator's annual report to the competent authority shows that the installation is not compliant with the directive, and if there is any other cause for concern.

How is the responsibility for the site ensured in the long term?

Geological storage will extend over much longer periods than the lifespan of an average commercial entity. Arrangements are needed to ensure the long-term stewardship of storage sites. The directive thus provides for sites to be transferred to Member State control in the long term. However, the polluter pays principle requires that the operator retain responsibility

for a site while it presents a significant risk of leakage. Also, rules are needed to ensure that no distortion of competition arises from different Member State approaches. Under the directive a storage site shall be transferred to the state when 1) all available evidence indicates that the CO₂ will be completely contained for the indefinite future, 2) a minimum period before transfer to be determined by the competent authority has elapsed, 3) a financial contribution for the post-transfer period covering at least the costs for monitoring for 30 years has been made and 4) the site has been sealed and the injection facilities have been removed. As this is the second key decision in the lifecycle of a storage site (the first being the decision to permit the site for use), a Commission review is foreseen at this stage too.

What will be the next steps in terms of transposition and implementation?

Member States have to transpose the directive into national legislation within two years after its publication and transmit the relevant provisions to the Commission. The Commission will then check conformity of the transposition legislation with the requirements of the Directive.

In the meantime, the Commission will prepare and adopt guidelines on a number of crucial issues including the composition of the CO₂ stream, transfer of responsibility and the calculation of the financial contribution for the post-transfer period, to help Member States implement the requirements of the directive. It will also establish an information exchange between the competent authorities of the Member States. Moreover, the scientific panel intended to help the Commission review the draft storage permits and draft decisions approving the transfer of responsibility will be established. Finally, the Monitoring and Reporting guidelines under the Emissions Trading Directive are in the process of being amended in view of the inclusion of CCS in the ETS.

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