

UK work on market mechanisms to encourage CCS, including the EU ETS

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Abstract

The UK Government uses market-based mechanisms to implement climate change policy. It is also UK policy to encourage the development and commercialisation of carbon dioxide capture and storage (CCS) technologies as one of a portfolio of options to reduce greenhouse gas emissions. This paper provides a summary and an update of UK work on market mechanisms for CCS, including the EU ETS, other incentives for the UK, and the CDM.

Keywords: Carbon Dioxide Capture and Storage, CCS, emissions trading, policy, incentives, UK.

Introduction

One approach adopted by the UK Government's for stimulating environmental improvements by industry is by using market-based mechanisms, with the objectives of giving industry choice in compliance options, and thus delivering the least cost means to achieve the environmental benefits. For example, the UK was the first country to establish an emissions trading scheme for CO₂. It is also UK policy to encourage development and commercialisation of carbon dioxide capture and storage (CCS) technologies, as one of a portfolio of options to reduce greenhouse gas emissions. Therefore, as well as work to address the legal and regulatory barriers to CCS deployment such as the international maritime treaties, the UK is examining market-based mechanisms to encourage CCS within the UK and working on such mechanisms in an EU and wider international context.

EU ETS

The UK welcomed the EU Emissions Trading Scheme (ETS) as the main market-based instrument aimed at reducing greenhouse gas emissions across the EU, and the UK took the initiative to facilitate CCS being included in the EU Emissions Trading Scheme and earn emission credits, in response to the Monitoring and Reporting Directive being issued in January 2004 [1].

The DTI initiated a group of 20 experts from across the EU with the objective to understand how CCS can comply with the EU ETS, and to produce suggested guidelines for monitoring and reporting. The members of this "Ad Hoc Group of EU Experts on Monitoring and Reporting for CCS in the EU ETS" came from expert consultants with knowledge in emissions verification, academia, industry, EU governments, European Commission DG Environment and DG Research. This group has met 7 times since its start in April 2004. On behalf of this group DTI then commissioned ERM and DNV to undertake a study to examine the issues, and this was extensively reviewed and contributed to by the EU Group.

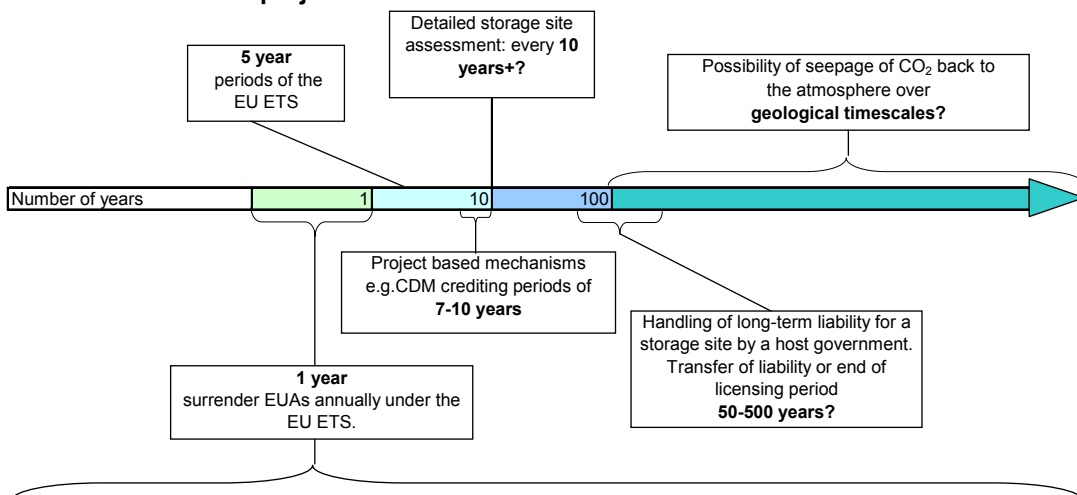
The study considered the options for CCS in the EU ETS, and proposed a method to account for CO₂ emissions reductions arising from CCS in a complete, consistent, transparent, accurate and relevant manner consistent with the existing EU ETS regulatory framework [2]. This included recommendation on the boundaries for CCS projects. The EU ETS is based upon emissions only within installation boundaries. In order to maintain the environmental integrity of the EU ETS, the approach for CCS proposed the reconciliation of fugitive emissions outside the installation boundary across the CCS chain up to and including the point of geological injection. This is because pipelines and injection points are not classed as installations under the EU ETS and therefore have no direct regulatory or financial incentive to reduce CO₂ emissions. However,

because storage involves longer timescales and different regimes to those in the EU ETS's annual accounting process, and because of the problems with using discount factors for hypothetical leakage rates, the study proposed that **CO2 geological storage** would be better managed and regulated **outside** of the ETS scheme by being handled by separate permitting regulation.

Under the EU ETS, CO₂ emissions from an installation over a calendar year should be reconciled *ex post* in the following calendar year, by 31 March, in line with the appropriate monitoring, reporting and verification requirements laid down in the EU ETS Directive (*Articles 14 and 15*). The result of this reconciliation process will determine the total number of EU Allowances that an installation must surrender to a competent authority in a Member State.

Installations under the EU ETS which use CCS will claim that the tonnes of CO₂ they have delivered to a CCS facility were not emitted in the calendar year during which they were exported. Thus, the sum of EUAs which the installation must surrender for compliance under the EU ETS will be reduced by the amount of tonnes of CO₂ sent to CCS. However, it will be necessary to reconcile the tonnes of CO₂ that an installation can claim via CCS against any CO₂ leakage that might occur during the transfer of CO₂ from the installation to a CCS facility, subject to *ex-post* verification.

Milestones in a CCS project



The EU ETS Compliance year

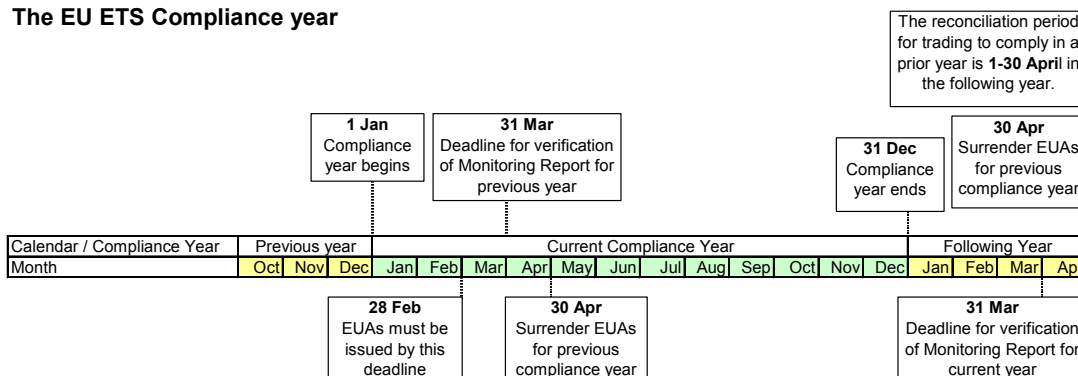


Figure 1. Milestones in a generic CCS project mapped onto EU ETS. (P.Zakkour 2005 [2])

Treatment of Storage Sites

Given the proposal that CO₂ storage sites be outside the EU ETS system, it was recommended that an appropriate permitting regime be established in the member state in order to regulate, manage and maintain the environmental integrity of the CO₂ storage site, and hence the EU ETS overall.

Consideration was given to how any potential seepage from the storage site to atmosphere may be effectively accounted and regulated in order to maintain the environmental integrity of the EU ETS. In order to account for any *potential* future emissions of the stored CO₂ back to the atmosphere, some observers have suggested that any emissions reductions credit given to project or installation operators employing CCS should be subject to some form of discounting. Alternatively, it has also been suggested that default factors could be developed and applied that assume a standard rate of leakage. However, these approaches are considered to present a number of problems in that:

- (i) they assume that the storage site *will* leak over a set time frame;
- (ii) that this time frame, and the flux rate can be established *ex ante* based on detailed understanding of the storage reservoir characteristics and the behaviour of the sub-surface stored CO₂;
- (iii) potentially the discount factor applied could be so small as to have little relevance when converted back to a tCO₂/yr basis (i.e. less than 1 tonne CO₂ or 1 EUA per year);
- (iv) the point in time at which any leakage might occur may not be relevant to any institutional structures and arrangements that currently exist, and;
- (v) it is unclear upon which basis appropriate discount rates or default factors could be selected.

These reasons add to the case that, for the monitoring and reporting framework methodology for CCS under the EU ETS, that CO₂ emissions from storage sites be excluded from an installation's CO₂ inventory.

However, storage sites would need to be controlled under an appropriate regulatory regime. This is not in place yet in the EU member countries. Some considerations for storage site permitting and licensing to ensure environmental integrity are as follows [3]:

- (i) the storage site operator would be required to show appropriate due diligence during storage site selection, such that all the available geological survey data and other evidence regarding the security of gas storage in the reservoir suggest within reasonable expectation, that the reservoir would not leak;
- (ii) in the event of any short-term leakage, an emergency plan was in place to minimize losses;
- (iii) storage site operators would be required to make a commitment to monitor and report quantified emissions of CO₂ leaking, by seepage or sudden release from the site, using good practice techniques likely to evolve over time;
- (iv) these losses would need to be reported to the host government, who would then take them into account in their National Greenhouse Gas Inventories under the UNFCCC;
- (v) that operating licenses could be time limited and subject to renewal/approval on the grounds that the storage site was operating satisfactorily.
- (vi) The requirement to monitor and report leakage by seepage or sudden release would be ongoing after the sealing of the injection wells and closing of the site. Ultimately, this responsibility would likely fall to the government under which's territory the CO₂ is being stored i.e. the host government would make a long term commitment to take responsibility for the stewardship of a storage site, including emissions monitoring and measurement, and also in the event of insolvency of the site operator, or license withdrawal or expiry.

Under the storage site permitting and regulatory regime, there are a range of options open to the regulator and operator to ensure EU ETS integrity. These options include making a requirement for

the operator to purchase of EUAs equal to the amount leaked, the setting aside of a proportion of EUAs from the project or the purchase of EUAs at the start of a project.

Monitoring and Reporting Guidelines

These elements and conclusions were used to produce a recommendation for outline monitoring and reporting guidelines [3]. This report outlines a proposed template for actual monitoring and reporting guidelines for operations listed in Annex I of EU ETS Directive (“installations”) consistent with Decision C(2004)130 Final of 29th January 2004 *establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to the Directive 2003/87/EC of the European Parliament and Council* (‘Decision C(2004)130’) [1].

The proposed template follows the CCS chain (installation – transportation – injection – storage). However, since the guidelines are for installations, and not storage sites, but part of the guidelines depend on annual reconciliations across the CCS chain, and also depend on sufficient assurance about the integrity of storage sites, an approach to handling the latter have been included the report’s Annex. Thus, the template is as follows (Figure 2) [3].

Figure 2. Template of Monitoring and Reporting Guidelines for CCS under the EU ETS

1. Introduction

1.1 Definitions

2. Draft interim monitoring and reporting guidelines for installations exporting CO₂ as part of a CCS chain

2.1 General Principles

2.2 Boundaries and completeness criteria

2.3 Determination of CO₂ emissions

2.4 Calculation of CO₂ emissions

2.4.1 Calculation of CO₂ generated by an installation

2.4.2 The mass balance approach to calculating fugitive emissions

2.4.3 CO₂ seepage from storage sites

2.5 Determination of non-CO₂ emissions

Annex I – Requirements for operators undertaking activities as part of a CCS chain receiving CO₂ from installations undertaking activities listed in Annex I of Directive 2003/87/EC.

The recommendations and outline guidelines have been presented to the EC to inform their ongoing work on CCS in the EU ETS.

ECCP Working Group on CCS

The European Commission are taking this work on CCS and EU ETS forward through the use of the European Climate Change Programme’s Working Group on CCS [4]. This is a group made up of a range of stakeholders, including Member States’ governments, industry and NGOs, and its policy recommendations to the EC will include those on the EU ETS. This group was organised by DG ENV and met over four meetings from February to May 2006. The third meeting on the 24 April addressed incentives and there was broad across stakeholders consensus that CCS should be allowed within the EU ETS. This Working Group is planning to report later in 2006.

UK market incentives

However, the market stimulation provided on the EU ETS will not necessarily provide adequate incentives to industry to invest in CCS, partly due to the current and expected value of EU ETS credits and the anticipated cost differentials of CCS options, and because of uncertainty in the ETS over investment timescales required for this level of infrastructure investment, ie how plants with CCS will be treated in the different phases of the EU ETS. The UK’s Carbon Abatement Technology Strategy recognises that in the short-term this market mechanism may not fully incentivise CCS, and that more targeted support for CCS may be required [5].

Therefore the UK's Chancellor of the Exchequer announced in his budget speech in March 2005 *"It is now clear that - as well as renewable sources of energy - cleaner fossil fuel technologies, including the capture of carbon dioxide and its long-term storage underground, are likely to become crucial elements of carbon reduction strategies over the next few decades, particularly for emerging economies. These technologies have the potential to provide a step change in reducing emissions. I can therefore announce today that as part of the UK Government's continuing support for research and development in this field we will now examine the potential of economic incentives to encourage carbon capture and storage"* [6].

This work was started as part of the UK Government's review of its overall Climate Change Programme, which was tasked to examine possible measures to encourage the initial commercial deployment of CCS in the UK, and to examine the cost and market implications of such measures. This work is ongoing and is being taken forward within the broader context of the UK Energy Review, which is considering possible mechanisms for reducing CO₂, and within the HM Treasury review and consultation "Carbon Capture and Storage: A consultation on barriers to commercial deployment" (March 2006) [7]. This Treasury consultation will "establish whether or not there is a case for Government intervention to incentivise CCS as part of a wider policy framework which seeks to reduce carbon emissions. If this case were established, the Government would need to give consideration to the incentive mechanisms that might be used.the list of possible instruments normally includes regulation, subsidies, tax, trading schemes and obligation schemes...and carbon contracts. " The deadline for responses to this consultation was 11 May 2006. The findings of this consultation and review will be presented at GHT8 if they are available and in form suitable for the public domain at that time.

Clean Development Mechanism (CDM)

The UNFCCC climate change conference at Montreal in Dec 2005 was notable for its success in countries agreeing to work on considering possible future actions. It was also notable for one new topic that had significant profile and focus of attention at the conference – Carbon Dioxide Capture and Storage (CCS). There were two significant areas for CCS to be considered. The first was the scientific and technical review of the IPCC Special Report on CCS.

The second significant area was under the Clean Development Mechanism (CDM). The first CDM proposal had been submitted to the CDM Executive Board, but they referred it to the main UNFCCC meeting (COP/MOP) as to whether it was an eligible technology. Therefore at Montreal the CDM working group at COP/MOP considered this issue. After much deliberation, it concluded that further work was necessary on how CCS would work under CDM, specifically looking at the areas of project boundary, leakage, and permanence [8].

In summary they recommended:-

- to hold a workshop on CDM and CCS after the IPCC Inventory Guidelines report is out (Apr06) linked to the next SBSTA meeting (22 May) ;
- for parties to provide submissions to UNFCCC secretariat by 13 Feb on how CCS and CDM could work;
- for the CDM EB to consider any new methodologies;
- and to consider at COP/MOP2 all these results so as to decide on how to handle CCS within the CDM.

The UK recognises the significant potential benefits of CCS to reduce GHG emissions in economies with high fossil fuel use, such as China. DTI assisted with information on CCS at Montreal and is working with UK Defra to develop the UK position and responses to feed into the EU position.

Aware of the high level of industry interest in this, DTI held a meeting of the 'EU Ad Hoc Group of Experts on CCS and EU ETS' on the 16 January at DTI to discuss CDM and CCS, where industry and government attendees were briefed on the issues and background. The meeting facilitated a group of industry representatives to subsequently produce an information paper on the three main areas (boundary, leakage, and permanence) using their technical knowledge and experience, which is expected to be used for to provide information to the overall process of considering CCS and CDM.

Conclusions

CCS can play a significant part on reduction of GHGs, particularly for economies more reliant upon fossil fuels. However the current market-based incentives for GHG-reduction need to be clarified and confirmed for CCS in order to incentivise, and the UK is examining whether possible further incentives may be required. Consequently UK work is ongoing on incentives at the UK, EU and international level. CCS is a large-scale capital-intensive technology, consequently requiring corresponding project development lead times, and for industry to make such investment decisions the uncertainties in incentives should be removed to encourage deployment of CCS within the desired timescales.

References

- [1] EC. Decision C(2004) 130 Final of 29th January 2004 *establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to the Directive 2003/87/EC of the European Parliament and Council*
- [2] Zakkour P. et al. Developing Monitoring, Reporting and Verification Guidelines for CO₂ Capture and Storage under the EU ETS. Dr P Zakkour, C Girardin, L Solsbery, S Haefeli, P Murphy. Jan 2005. Report Coal R277 DTI/Pub URN 05/583
www.dti.gsi.gov.uk/energy/coal/cfft/cct/pub/pdfs/r277.pdf
- [3] Zakkour P and Solsbery L. Outline Template for Draft Interim Monitoring and Reporting Guidelines for CO₂ Capture and Storage under the EU ETS. August 2005. Report Coal R2289 DTI/Pub URN 05/1564
www.dti.gsi.gov.uk/energy/coal/cfft/cct/pub/pdfs/r289.pdf
- [4] EC. European Climate Change Program Working Group on Carbon Capture and Geological Storage. Europa.eu.int/comm./environment/climat/stake_wg.htm
- [5] DTI. A Strategy for Developing Carbon Abatement Technologies for Fossil Fuel Use. DTI Carbon Abatement Technologies Programme. DTI and Defra. June 2005
www.dti.gsi.gov.uk/energy/coal/cfft/cct/pub/catreportlinked.pdf
- [6] Chancellor of the Exchequer. Budget Speech and Report 2005. March 2005. http://www.hm-treasury.gov.uk/media/AA7/59/bud05_chap07_171.pdf. Section 7.24
- [7] HM Treasury. Carbon Capture and Storage: A consultation on barriers to commercial deployment. 22 March 2006.
www.hm-treasury.gov.uk/media/1E0/C5/bud06_carbon_250.pdf
- [8] UNFCCC CMP.1 "Further Guidance Relating to the CDM" parags 5-8.
http://unfccc.int/files/meetings/cop_11/

Background References

- de Conninck H C et al. Implementing clean coal projects under Kyoto. IEA CCC/97. April 2005.
- Haefeli S et al. CCS Issues, Accounting and Baselines under the UNFCCC. IEA 2004.
- The Royal Society. Economic Instruments for the reduction of CO₂ emissions.. Policy Document 26/02. November 2002. www.royalsoc.ac.uk
- Dixon T et al. Cleaner Coal Technologies and the CDM. AEAT/ENV/R0338. Report for EC DG TREN. October 2000.