



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 23.1.2008  
COM(2008) 13 final

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels**

{COM(2008) 30 final}  
{SEC(2008) 47}  
{SEC(2008) 48}

## TABLE OF CONTENTS

1.	Introduction .....	3
2.	Costs and benefits of CCS.....	4
3.	Overcoming obstacles to CCS .....	5
4.	An EU Structure to stimulate the demonstration of CCS in Power Plants .....	6
5.	Catalyzing the finance for CCS.....	8
5.1.	<i>Mobilizing decisive industry commitment will be crucial</i> .....	8
5.2.	<i>Paving the way for strong Member States' involvement</i> .....	9
5.3.	<i>Identifying sources of financing at EU level</i> .....	10
6.	Preparing early for wide-scale deployment.....	10
7.	Conclusions .....	11

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels**

**(Text with EEA relevance)**

**1. INTRODUCTION**

Recognizing that human activities contribute significantly to climate change, the EU has adopted ambitious targets for reducing the emissions of green house gases in the coming decades. These targets will not be achieved without significant reduction of CO<sub>2</sub> emissions from the energy sector, where the use of fossil fuels, primarily coal and gas, in power generation leads to approximately 40% of all CO<sub>2</sub> emissions in the EU.

As fossil fuels remain important parts of the EU and global energy mix, strategies for addressing climate change must include solutions for power generation from fossil fuels with radically reduced carbon footprint. In this context, technologies for capture and storage of CO<sub>2</sub> (CCS) represent a crucial element in a portfolio of existing and emerging technologies with the potential to bring the cuts of CO<sub>2</sub> emissions needed for meeting targets beyond 2020<sup>1</sup>.

Wide-scale application of CCS in power plants can be commercially feasible in 10-15 years, enabling CCS by 2020 or soon after to stand on its own feet in an Emission Trading Scheme (ETS) -driven system as a crucial instrument for the elimination of CO<sub>2</sub> emissions from fossil fuels in power generation.

This will not happen without an immediate start to necessary preparatory steps; early demonstration is particularly needed for CCS technologies, already globally developed and used in other applications, to be adequately adapted for a large-scale application in power generation.

Calling for enabling low-CO<sub>2</sub> power generation from fossil fuels by 2020, the European Council endorsed in March 2007 the Commission's intention to stimulate the construction and operation by 2015 of up to 12 demonstration plants of sustainable fossil fuel technologies in commercial power generation.

---

<sup>1</sup> While improvements in combustion efficiencies will be indispensable, they alone will not deliver the necessary reduction of CO<sub>2</sub> emissions.

In November 2007, the EU Strategic Energy Technology Plan<sup>2</sup> (SET-Plan) recognized the demonstration of the use of CCS in fossil fuels-based power generation as one of the areas on which European technology development should focus resources. This will allow Europe to capitalize on achievements to date and translate its current lead in CCS development into commercial opportunities for European businesses, creating new high-skilled jobs in Europe.

Complementing the Commission proposal for a Directive on Geological Storage of CO<sub>2</sub> creating the legal framework for CCS in the EU, the present Communication takes the efforts on CCS forward, aiming at the creation of a structure to coordinate and effectively support large-scale CCS demonstrations and creating conditions for bold industrial investments in a series of plants. These investments will need to be sustained for a relatively extensive period of time, starting now and lasting until 2020 and possibly even beyond.

It is imperative that European efforts on CCS demonstration within an integrated policy framework including focused R&D efforts and public awareness and acceptance measures start as soon as possible. A delay of 7 years in demonstration leading to same delay in global introduction of CCS can mean over 90 Gt of avoidable CO<sub>2</sub> emissions being released by 2050 worldwide<sup>3</sup>, equivalent to over 20 years of current overall EU emissions of CO<sub>2</sub>.

## **2. COSTS AND BENEFITS OF CCS**

The investments to bring CCS to market are substantial. Around €1bn will have to be spent between now and 2020 on R&D activities to bring CCS technologies to a state in which they can be widely deployed commercially<sup>4</sup>.

In addition, early demonstration of CCS in industrial-scale power plants will require further spending in the order of billions of euros: at current technology prices, up-front investment for CCS-equipped plants is due to the costs of capture elements and transportation and storage equipment approximately 30-70% (i.e. several hundred million euros per plant) more than for standard plants; moreover, operating costs are currently 25-75% more than in non-CCS coal-fired plants, mostly due to efficiency losses and costs of capture and CO<sub>2</sub> transport.

However, the European Technology Platform for Zero Emission Fossil Fuel Power Plant (ETP-ZEP), gathering European energy companies, equipment suppliers and oil/gas businesses as well as NGOs, estimates that with a focused R&D and demonstration effort, costs of CCS can be brought down by 50% between now and 2020, facilitating commercial deployment<sup>5</sup>. Incremental capital and operating costs associated with CCS are expected to drop further thereafter through learning curve effects and economies of scale as generally observable in industrial technology development.

---

<sup>2</sup> The SET-Plan provides policy orientation for European R&D efforts, identifying several key technologies required for its vision of a Europe with a thriving and sustainable economy keeping world leadership in a diverse portfolio of clean, efficient and low-carbon energy technologies.

<sup>3</sup> IAES.

<sup>4</sup> Industry estimates; see also IAES for details.

<sup>5</sup> [www.zero-emissionplatform.eu](http://www.zero-emissionplatform.eu).

Investment in the development and deployment of CCS technologies will bring major benefits. International Energy Agency (IEA) analyses, using several scenarios to 2050 with varying conditions, show that CCS can contribute between 20 and 28% of the achievable global CO<sub>2</sub> emission reductions<sup>6</sup>, complementing those from efficiency and renewables.

In the EU alone, power sector CO<sub>2</sub> emissions reductions through CCS will reach in a market-based scenario 161 Mt in 2030 and 800-850 Mt in 2050<sup>7</sup>, representing respectively 3.7% and 18-20% of current overall CO<sub>2</sub> emission levels. In addition to its deployment in power generation, CCS may provide solutions for energy intensive industries, contributing significantly to reducing the emissions also in those industrial sectors.

CCS will be equally important for managing future CO<sub>2</sub> emissions of countries such as China or India, already the largest coal users and emitters<sup>8</sup>. Maintaining the EU's global lead in developing CCS technologies and their early market deployment in the EU will generate new commercial opportunities for European businesses in these countries.

If efforts to make CCS commercially feasible in the EU by 2020 are not supported by policies, new coal-fired power plants may be built without CCS or retrofitting features. This would risk locking carbon-intensive technologies for several decades into as much as 70GW of capacity installed in the coming 10-15 years, representing over a third of the current coal-fired capacity.

### 3. OVERCOMING OBSTACLES TO CCS

First steps to enabling CCS in power generation can be taken without substantial additional costs. The Commission's proposal for CCS Directive aims to resolve all the major CCS-related legislative issues and to provide a comprehensive regulatory framework to ensure the safety of CCS deployment. With risks mitigated, legal barriers to CCS can be addressed and the proposal includes the appropriate provisions. Furthermore, the Commission confirms that the current ETS, before 2012, can recognize CO<sub>2</sub> captured and safely stored as not emitted<sup>9</sup>.

With active involvement of the European Commission, changes in international regimes as regards CCS acceptance have recently taken place<sup>10</sup>. The changes show that the EU can take leadership in shaping international regulation for CCS. Once the amendments are ratified, large storage capacities under the North Sea seabed can be opened up.

---

<sup>6</sup> IEA Energy Technology Perspectives 2050 and Stern Review.

<sup>7</sup> Impact Assessments for the CCS Directive and the SET Plan.

<sup>8</sup> Two-thirds of the increase in global coal use will come from China and India. Already today, one new coal-fired power plant is put into operation every week somewhere in the world.

<sup>9</sup> CCS projects can be opted in for 2008-2012.

<sup>10</sup> Following the amendments to the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (the "London Protocol"), an agreement of signatory parties to The Convention for the Protection of Marine Environment of the North-East Atlantic ("OSPAR Convention") was for instance reached in June 2007 enabling CCS to be considered under the Convention.

To provide the necessary legal certainty to operators and gain public confidence in the safety of CCS, it will be crucial that the Commission proposals be quickly adopted and transposed and that the changes in international regimes be ratified speedily by the Member States concerned. Demonstration, continued research and information transparency will also provide reassurance to the public on the overall safety of the process. Open and coordinated information activities will be necessary.

Economic hurdles for CCS will take more time to overcome. Even with the cost reductions expected from research and demonstration, the deployment of CCS will mean increased fixed as well as variable costs compared to power generation without CCS. However, industry and independent expert opinions concur<sup>11</sup> that at CO<sub>2</sub> prices around or even below 35€/tCO<sub>2</sub>, and assuming full recognition of CCS in ETS, power plants using CCS after 2020 will not be at a competitive disadvantage vis-à-vis standard power plants<sup>12</sup> because the costs of CO<sub>2</sub> avoidance through CCS will be at least equal if not lower than the cost of acquiring emission rights.

To provide long-term clarity on the future of ETS, the Commission is further making a legislative proposal for the post-2012 ETS. This proposal includes recognition of CCS as a legitimate emission-reduction technology, establishing a sound basis for long-term economics of CCS in the EU.

#### **4. AN EU STRUCTURE TO STIMULATE THE DEMONSTRATION OF CCS IN POWER PLANTS**

Pursuant to the European Council Conclusions of March 2007, the SET-Plan creates a framework within which CCS development can be brought forward. It identifies CCS as one of the strategic energy technologies and sets the time horizon of 2020 for making its use in power generation a realistic option, recognizing that Europe needs to proceed with the demonstration of these technologies in large-scale power generation while improving them through continuous R&D. CCS demonstration can thus be a new case of a European initiative under the SET-Plan, demonstrating the merits of concerted European effort.

CCS technologies are already used in industry but will need to be adapted for use in large-scale power plants and improved through advanced R&D. European industry is clearly involved<sup>13</sup> and strategic research needs are well defined<sup>14</sup>. Over 20 potential demonstration projects have been signalled by European industry in the past 12-18 months<sup>15</sup>.

---

<sup>11</sup> ETP-ZEP, IEA, the Stern Review, and others (IAES).

<sup>12</sup> In the period until 2020 or so, the incremental costs incurred by early CCS demonstration projects would correspond to significantly higher CO<sub>2</sub> prices (up to 70 €/tCO<sub>2</sub>).

<sup>13</sup> European energy companies, equipment suppliers and oil/gas businesses as well as NGOs are actively involved in the ETP-ZEP.

<sup>14</sup> Priorities for European R&D on CCS have been identified on the basis of EU-supported R&D and knowledge and experience in the ETP-ZEP (IAES).

<sup>15</sup> IAES.

Bringing a sufficient number of them to realization in the required time necessitates a concerted action by European industry, Member States and the European Community. Several European countries have announced initiatives to support demonstration projects on their territories<sup>16</sup>.

A coherent and coordinated EU-level action can add value and enhance the overall impact, whilst respecting the autonomy of national initiatives. As outlined in the SET-Plan and to stimulate at EU level the effective demonstration of sustainable fossil fuel technologies in commercial power generation, **the Commission proposes to launch a European Industrial Initiative on CO<sub>2</sub> capture, transport and storage starting in 2008**. While stimulating large-scale demonstration, this Initiative will also aim at addressing in an integrated manner the need for continuous research and for increasing public awareness and acceptance.

To secure an instant effect of the Initiative, the Commission will set up in 2008 a Support Action under FP7 to create and animate a network of CCS demonstration projects. The Commission will invite projects fulfilling minimum qualification criteria<sup>17</sup> to henceforth come forward to benefit from European action.

In this way, the Commission will provide first movers a means of coordination, exchange of information and experience and identification of best practices. Information gathered will help focus policies establishing a long-term value chain for CO<sub>2</sub> and will guide coherent and effective interaction of participating projects with related R&D undertaken across the EU.

The Commission will ensure that verification and acceptance of projects into the network happens in close consultation with Member States, experts from European industry and representatives of civic society.

In exchange for sharing of information on progress and experience, projects entering the project network will gain visibility and a marketable identity ("*a European logo*") as parts of an EU-driven initiative. Recognition of contribution to a common European cause can facilitate projects' access to financial support at national, Community and international levels. Public awareness actions and interaction with partners in third countries undertaken collectively in a coordinated manner will be more cost-efficient and have higher impact, providing clear benefits for all projects.

The Governance instruments outlined in the SET-Plan will be applied to steer the actions and further development of the European Industrial Initiative on CCS<sup>18</sup>. In particular, the European Community Steering Group on Strategic Energy Technologies, in close cooperation with the stakeholders' initiatives such as ETP-ZEP, will be crucial for assessing the possibility of extending the scope of the European Industrial Initiative beyond a project network and in determining financing options for such extension of scope.

---

<sup>16</sup> UK, Netherlands, and Norway; in preparation in Poland, Germany and Spain.

<sup>17</sup> See IAES for a preliminary opinion on the criteria to be used.

<sup>18</sup> In particular, the European Community Steering Group on Strategic Energy Technologies and the Energy Technology Information System. Furthermore, the Research Alliance might align existing R&D activities in Europe in the relevant fields.

Given the importance of CCS on the global scale, it will be important to include an international dimension, by developing and accelerating the ongoing European collaboration with China on CCS demonstration and expanding to other key emerging economies<sup>19</sup>. Of equal importance will be a systematic cooperation with other advanced economies developing CCS technologies for use in power generation.

## 5. CATALYZING THE FINANCE FOR CCS

Early demonstration will need to cover substantial additional capital requirements and increased operating costs<sup>20</sup>.

The European energy businesses involved in power generation from fossil fuels will gain in CCS an important instrument enabling them to remain important players in European energy landscape and providing also new business opportunities. They can be therefore rightly expected to make significant commitments of their own resources in the interest of early demonstration. Public funds may be also needed for some projects, albeit for a limited time of the demonstration period and at levels depending on the future development of ETS prices.

As the financial requirements of CCS demonstration represent a major hurdle, the availability of such resources may condition the number of CCS projects undertaken in Europe and ultimately determine the success of CCS in Europe. While the Commission has significantly increased resources available for Clean Coal and CCS<sup>21</sup>, it can under current budgetary circumstances provide only a minimum part of the support necessary to ensure that sustainable power generation from fossil fuels is brought to the market.

### 5.1. *Mobilizing decisive industry commitment will be crucial*

The energy industry has demonstrated through the ETP-ZEP a vital initiative on CCS and has been devoting resources to R&D and pilot projects for several years. However, clear commitments of substantial resources to large-scale demonstration have been scarcer.

ETP-ZEP published in October 2007 its vision of a Flagship Programme, aiming in particular at the coordinated construction and operation of a set of CCS demonstration projects by 2015. The programme specifications identified the need for financial support but most industry players have yet to define the size and timing of own financial commitments to individual projects.

---

<sup>19</sup> In addition to its continued engagement with China (namely through the "Near-Zero Emission Coal project - NZEC" following on the heels of the 2005 EU-China partnership on Climate change and the subsequent 2006 Memorandum of Understanding), the Commission also laid the groundwork in 2007 for CCS collaboration with India and South Africa.

<sup>20</sup> Equipping a new power plant with elements needed for early demonstration of the full CO<sub>2</sub> capture, transport and storage chain would entail incremental costs requiring (for a 300MW plant) either an additional upfront capital allocation of roughly €300-500m or ongoing additional revenue of €45-125m per year over the life of the project.

<sup>21</sup> While there was no "Clean Coal" action in FP6, the "CCS" action disposed of allocations of €15-20m on annualized basis. The combined allocations for "Clean Coal" and "CCS" actions in FP7 will use more than double. In addition, part of the annual sum of ca € 9m dedicated to coal-related research from the Research Fund for Coal and Steel will continue to go to complementary R&D.

If fossil fuels are to continue playing their valuable role in the energy mix, it is crucial that European industry associated with them makes clear, early and decisive commitments. In addition to the power sector, energy intensive industries may want to come forward with their own ideas for the development of CCS in their sectors. The inevitability of action on climate change offers power generators and other businesses prepared to move early into the CCS market the possibility of a real commercial benefit.

The dedication of substantial resources by companies is a precondition for the stimulation of sustainable fossil fuel technologies in commercial power generation. Without bold funding decisions by the companies at the earliest opportunity, complementary public funding may not be triggered.

The longer the power industry takes to start embracing the CCS technology, the more policy-makers will be obliged to look at the option of compulsory application of CCS technology as the only way forward.

## **5.2. *Paving the way for strong Member States' involvement***

As fossil fuels represent a dominant part of the energy mix in a number of Member States and are expected to play a long-term role in their security of supply and competitiveness, a number of EU countries have every interest in ensuring the development of CCS. It is up to each Member State to decide how it will support CCS demonstration in addition to R&D, addressing the higher up-front and operational costs.

Some Member States have already identified possible approaches (including feed-in tariffs or up-front investment grants). However, the suitability of concrete measures can only be assessed on a case-by-case basis, and it is also up to each Member State to decide how its support scheme can be financed. Use of some revenues coming from auctioning under the ETS could be appropriate. EU Structural and Cohesion Funds can be a partial source of funding in some Member States<sup>22</sup>.

Some national support measures to assist demonstration projects, which represent by far the highest cost of enabling CCS technologies, are likely to entail state aid. The Commission expects this support to be a temporary assistance<sup>23</sup> until such technology becomes competitive. The Commission is indicating in the revision of the Community guidelines on state aid for environmental protection<sup>24</sup> the legal grounds for declaring compatible state aid to CCS demonstration power plants<sup>25</sup>.

---

<sup>22</sup> Although no Member State has created specific provisions in their operating plans for the period 2007-2013, some assistance to CCS demonstration power plants could fall within planned research and innovation activities. Opportunity for amendments to explicitly cover such plants can arise following strategic reviews of programmes.

<sup>23</sup> After the demonstration period, CCS will be expected to compete on a commercial basis, within the future ETS.

<sup>24</sup> SEC(2008) 64 adopted concurrently.

<sup>25</sup> The guidelines state that the use of CCS in power generation, practically non-existent to date, is likely to be limited in the next decade mainly to demonstration projects. Insofar as projects are not subject to other state aid guidelines, the Commission believes that a declaration of compatibility of the limited number of state aid cases arising in connection with such projects could be best granted directly under the provisions of the primary European legislation: Articles 87(3)(b) or (c) and 88(3) of ECT.

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, without prejudice to due procedure and individual merit of each project, to view favourably the use of state aid for covering the additional costs related to CCS demonstration in power generation projects.

### **5.3. *Identifying sources of financing at EU level***

The SET-Plan proposes to examine avenues for raising additional funds for the priorities identified in the Plan. The Commission will address the issue of resources for CCS development in the Communication on financing low carbon technologies planned under the SET-Plan for 2008. Identifying additional resources will be crucial particularly if the European CCS Initiative is to mature into a common action going beyond the coordinating structure of a project network.

Using European financial institutions will also be instrumental. The European Investment Bank (EIB) is currently analyzing the possibility of developing new products for financing CCS in addition to already existing means under the Risk Sharing Finance Facility (RSFF)<sup>26</sup>. Recognition of a project's European identity may facilitate access to such financing, similarly to the current practice with Trans-European Energy Networks (TEN) projects. For projects in third countries, specific instruments such as the EIB's Climate Change Financing Facility can be used<sup>27</sup>.

Whilst the Commission cannot aspire to financing significant investment costs from FP7, a limited financing of preparatory stages may be provided to a few most deserving projects, e.g. the most innovative or promising early risers. In the first call for proposals under FP7, the Commission opened the possibility of supporting feasibility and engineering studies for large-scale CCS demonstration projects. In the 2008 call for proposals, a similar topic will be open.

## **6. PREPARING EARLY FOR WIDE-SCALE DEPLOYMENT**

New infrastructures will need to be built up in Europe to facilitate a successful transition towards a low carbon energy system. In the particular case of power generation with CCS, this implies an early need for infrastructure for transport and storage of CO<sub>2</sub> and the linking in of emission sources, with non-discriminatory access rules comparable to those currently in place for existing electricity and gas infrastructure.

It will be important to develop the European dimension in these networks. Some focused, additional financial support may be necessary (e.g. for networks definition and detailed feasibility studies of individual infrastructure projects in the network). To this end, the Commission will propose a revision of the TEN-E guidelines to include CO<sub>2</sub> infrastructure (pipelines and storage sites).

---

<sup>26</sup> RSFF is a joint initiative of the EIB and the Commission aimed at providing risk financing for new technologies and R&D implementation projects.

<sup>27</sup> In a related development, the EIB signed a China Climate Change Framework Loan in the margins of the 10<sup>th</sup> EU-China Summit on 28 November 2007 and, subject to the proposals from Chinese authorities, is considering its use to support CCS demonstration in China.

## 7. CONCLUSIONS

The opportunities and challenges presented by CCS make it a priority of strategic importance in the development of new energy technologies for Europe. Early effective demonstration of technological viability of CCS in power generation, both in Europe and internationally, is a milestone on the road to its widespread use. With timely and bold industry and public initiatives and strong market-based stimuli to avoid CO<sub>2</sub> emissions, CCS can be commercially viable in 2020 or soon after.

To stimulate development of CCS in Europe, the Commission proposes in parallel with this Communication an enabling regulatory framework and the inclusion of CCS in ETS. The revised Community guidelines on state aid for environmental protection take a favourable view on CCS and indicate the legal grounds on which CCS demonstration projects can benefit from state aid. The Commission will in 2008 propose a revision of TEN-E guidelines to encompass CO<sub>2</sub> infrastructure.

In the framework of the SET Plan, the Commission proposes to launch a European Industrial Initiative on CCS as a base for the coordination, transparency and visibility of demonstration projects. This way, EU will take lead in large-scale demonstration world-wide and will maximize the benefits of early demonstration. In 2008, the Commission will establish, in this context, a project network allowing early-movers to exchange information and experience, maximize impact on further R&D and policy making, optimize costs through shared collective actions (e.g. vis-à-vis the public or third countries), and obtain recognition as parts of a crucial EU-wide initiative ("a European logo").

Early demonstration will not be feasible without major financial commitments. For the private sector, the inevitability of action on climate change offers power generators and other businesses prepared to move early into the CCS market the possibility of a real commercial benefit. The later such moves begin, the more policy makers will be obliged to look at the option of compulsory application of CCS technology as the only way forward.

Clear and decisive commitments from European industry will be essential for triggering consideration of a complementary contribution from public funds. In particular, those Member States intending to rely on coal in their future energy mix should implement support measures for early demonstration of CCS. Information obtained through the European Industrial Initiative will facilitate the analysis of the compatibility of such measures with EU's state aid rules. Mobilising additional resources may be necessary and will be further considered in the context of the SET-Plan, in view of extending the European Industrial Initiative on CCS beyond the scope of a project network.