Developing Carbon Capture and Storage in the European Union

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On 23 January 2008, as part of the Climate Action and Renewable Energy package, the European Commission made a legislative proposal to encourage the safe use of a promising family of new technologies known as carbon capture and storage. In this article, European Environment Commissioner Stavros Dimas explains the proposal and why the Commission has taken action now.

Climate change is the gravest long-term threat facing the world today. Global warming is accelerating and the consensus among leading scientists is that over the course of this century temperatures will reach dangerous levels, bringing an increased risk of irreversible and possibly catastrophic events, if the international community does not take urgent action to rein in emissions of carbon dioxide (CO₂) and other greenhouse gases.

The European Union has long been in the vanguard of international action to combat climate change but we cannot do it alone. This is a global problem requiring a global solution with the involvement of all. The number one priority is to get a new global climate agreement that is ambitious enough to achieve the deep reductions in worldwide greenhouse gas emissions needed in the medium and long run. Negotiations on this are under way and are due to be concluded by the end of 2009.

For the EU, the objective of the new agreement must be to limit global warming to no more than 2°C above the pre-industrial temperature because this is the ‘tipping point’ beyond which we would be in the danger zone, as world scientists told us in last year’s report of the Intergovernmental Panel on Climate Change. To stay within this temperature ceiling, worldwide emissions of greenhouse gases will need to be cut by at least 50% of 1990 levels by mid-century. This is a huge challenge but the reduction is technologically feasible and economically affordable – particularly when compared with the astronomical economic costs that unabated climate change is projected to cause.

The current situation, however, is that global emissions are continuing to rise. In its 2007 World Energy Outlook, the International Energy Agency estimates that emissions from energy production will increase 55% by 2030. It also expects that 85% of the projected increase in energy demand will be met by fossil fuels and that the use of coal worldwide will increase by almost three quarters.

Why CCS now?
The message is clear: fossil fuels, particularly coal, will continue to provide much of the world’s energy needs for decades to come, so we have to find ways to reduce their carbon emissions if we are to deal with global warming. This is true in Europe but even more so in the rest of the world and in particular in countries like China or India. Carbon capture and storage, or CCS, is one of the most promising new technologies in this area but it is still relatively untried. That is why on 23 January this year the European Commission proposed a legal framework to ensure the safety and environmental integrity of CCS projects and create the incentives necessary to bring CCS technologies into the mainstream.

Our goal is for CCS to be rolled out on a commercial basis by around 2020 so it can start contributing to emission reductions from then on. This requires pilot projects to be up and running in Europe by 2015.

Though CCS is expensive today, its future cost-effectiveness is a major argument in its favour. Studies show that reducing the EU’s CO₂ emissions by 30% by 2030 would be 40% - or €60 billion - more expensive without the use of a technology such as carbon capture and storage. These savings can be extrapolated on a global scale. The global market for CCS is expected to be considerable so Europe has much to gain by getting a head start.

Choosing the right carbon storage site is key to ensure the environmental security of a project. According to the Intergovernmental Panel on Climate Change a well-selected and managed site is likely to retain over 99% of the CO₂ injected into it for more than 1000 years.

In drawing up a set of criteria to ensure that in practice a site is well-selected, safe and well-managed, the Commission took into account basic safety criteria, including the likelihood of leakages and the possible long-term requirements for maintaining a site. The first step in selecting a site is to construct a model and test the likely behaviour of the CO₂ once injected and identify any population centres or sensitive ecosystems that could be affected by the storage. Only if the tests show that in practice and under the proposed conditions there is no significant risk of leakage or of damage to human health and property can the site be used.

Once a site is being used for CO₂ storage a monitoring programme must be put in place to make sure that the CO₂ is in fact behaving as expected and that there are no leakages. The competent authority must inspect the site at least once a year.

If any leakage is identified a further set of measures kick in. The first step is for the company operating the site to take corrective measures to rectify the leakage. But the competent authority responsible for monitoring the project can require additional measures if it feels it is necessary, or it can decide to carry out these measures itself and recover the costs from the operator.

The second obligation in case of leakage is to surrender Emissions Trading System (ETS) allowances for any leaked emissions. The companies operating the site will have to monitor and quantify their emissions and surrender allowances to cover them, In this respect the monitoring of the ETS will be closely co-ordinated with monitoring of geological storage.

The third obligation is to rectify any local damage to the environment caused by CO₂ leakages according to existing environmental liability legislation.

Striking a balance

The reason for taking action is that the European Union will not be able to meet its climate change goals without carbon capture and storage. However, the reason for caution and for taking all necessary environmental and safety safeguards stems from the risks presented by concentrated CO₂.

The Commission’s proposal for a directive on the geological storage of carbon dioxide creates a framework that would allow CCS to exist while establishing a comprehensive set of environmental safeguards. In doing so the Commission considers that the risks of carbon capture and storage can be successfully managed – as demonstrated by the storage of natural gas – and that there is a pressing need for the technology. And as a result of the international convention on the protection of the marine environment (OSPAR) having been modified to allow the storage of carbon dioxide below the sea floor it is expected that a number of European CCS projects will go forward soon with the gains from the technology already eligible to offset carbon emissions in the emissions trading system.

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Assuming responsibility for a site

To receive a permit companies wishing to operate a CCS site will need to set up and maintain some financial security measures to cover their liabilities. These measures must cover costs such as decommissioning and making the site safe, monitoring the site after its closure and ensuring that corrective measures and surrendering carbon allowances. Environmental liability responsibilities would not be covered by these security measures.

In the Commission’s proposal the risks of maintaining a site are distributed between the operators and the state. The plan is that the state should assume responsibility for the site when evidence indicates that the stored CO₂ is completely contained for the indefinite future. But under the polluter pays principle companies operating CCS sites will have to bear the brunt of the risk. This approach puts CCS on the same footing as other emission reduction options where the sharing of liabilities between the state and industry is effectively a subsidy to CCS.

Competent authorities will have a crucial role to play in the implementation of some of the proposal’s various elements in which they will have the final say. But to ensure harmonised implementation across the EU and the safety and integrity of projects in their early phase of operation, the proposal provides for a Commission review of the two key phases of a storage project, namely the initial permitting of the site and its transfer to the state.

Securing public confidence in the safety of the technology must be the number one priority. Should CCS be badly implemented or should something go wrong the reputation of the technology will be tarnished and a major source of carbon emission reduction option lost. We must ensure that this does not happen.

If successful capturing and storing emissions could quickly become a condition for entering and operating in the EU energy market, especially if carbon prices rise sharply. This is why the Commission’s proposal on CCS has a number of provisions on accessing the Union’s CO₂ transport and storage network. The principle used in the proposal is fair and open access where access is negotiated rather than regulated and where member states determine the conditions for access. The Commission will monitor the process to prevent uncompetitive practices from emerging.

With a robust management framework in place the main legislative obstacles to CCS must now be removed. The two main ones are to amend the Water Framework Directive¹ to allow CO₂ storage in saline aquifers and to remove the restrictions on the capture, transport and storage of CO₂ from the European Union’s waste legislation.

Providing the right incentives and conditions for development

The success of carbon capture and storage will depend on carbon prices and the cost of rolling out the technology. Widespread take up of the technology will only occur if the price per tonne of stored carbon is lower than the carbon price in the emissions trading system. But since the aim of the revised ETS is to reduce emissions of greenhouse gases by 20% the prices of carbon will most likely go up.

Bringing down the costs of the technology will require substantial investment. The commitment of the industry will be important to put to good use the funding provided by national authorities. The CCS technology will be a good candidate for receiving parts of the revenue national authorities will be earning from the auctioning of carbon allowances in the ETS. The Commission will look favourably on state aid geared towards the development of the carbon and capture technology.

At one point the Commission considered making CCS mandatory, but in the end opted to create a framework under which the technology could develop and be rolled out when most appropriate. This decision rested on the assumption that carbon capture and storage could not be applied in the same way throughout Europe and that making CCS mandatory would disproportionately burden smaller member states. The Commission’s proposal thus gives member states the option of going ahead with CCS and for companies to decide whether doing so is cost effective.

The way forward

The Commission believes that the time is ripe for moving forward with carbon capture and storage. Given the importance of tackling climate change the aim of the Commission’s proposal was to present an option that could substantially reduce emissions of carbon dioxide being emitted into the atmosphere. Having studied the risks from capturing, transporting and storing carbon dioxide the Commission believes the risks are very low and can be managed. The European Parliament and Council must now come to an agreement before carbon capture and storage can move forward.

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1. COM(2008)17
3. Directive 2000/60/EC