

Bellona Position Paper on CCS and Emission Performance Standards (EPS)

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The Bellona Foundation, 1 December 2008
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Summary

According to the Intergovernmental Panel on Climate Change (IPCC), global greenhouse gas (GHG) emissions must be reduced by 50 to 85 percent by 2050 to avoid dramatic consequences of global warming. Enhanced energy efficiency and increased renewable energy production is not enough to give the required emission reduction, and CO₂ capture and storage (CCS) is therefore required as a bridging technology to the renewable society. CCS can be commercially viable by 2020 if new regulations and incentives are established, or else CCS will be a reality too late to meet the climate challenge.

The required regulations and incentives are: (1) adaptation of regulations that allows and regulate CO₂ capture and storage, (2) incentives to ensure demonstration projects are established by 2015, and (3) market regulations to establish a market for CCS from 2020.

Adaptation of the proposed EU directive on CO₂ storage will be a good start to establish the necessary regulations, and incentives for demonstration projects should be a combination of EU funding, Member State funding and contribution from industry. Market regulation for CCS should be based on the EU ETS combined with low emission certificates or emission performance standards.

If the price of EU ETS remain low, the ETS is not sufficient to ensure wide CCS deployment. It is therefore suggested to introduce an emission ceiling of 150 g/kWh for new power plants built after 2010 and for existing plants from 2020.

Why CCS?

The fact that global warming is already taking place and is a problem caused by human activity is firmly established by an increasing number of scientific sources, amongst them the Intergovernmental Panel on Climate Change (IPCC) ^[1].

Failing to tackle global warming could have dramatic consequences. Rising sea levels, retreating glaciers, and increased frequency of droughts, floods and tropical storms would put half of the world's species at the risk of extinction and hundreds of millions of people in desperate need of food and water.

To have a reasonable chance of avoiding such dire consequences, the global average temperature must not increase by more than 2 °C above the pre-industrial level. According to the IPCC, this necessitates an overall 50 to 85 percent reduction of global greenhouse gas (GHG) emissions by 2050 with the peak in emissions occurring between no later than 2015.

There are several reasons to aim for reductions in the higher end of this interval. Firstly, emissions have increased steadily by 3 percent per year since 2000, so a peak by 2015 might be hard to achieve. A delayed peak in emissions means that the reduction target must be set relatively higher. Secondly, as the IPCC points out, the emission reductions necessary to meet a particular stabilization level may have been underestimated owing to missing carbon cycle feedbacks

Achieving 85 percent cut in global GHG emissions by 2050 is possible^[2], however it requires simultaneously deployment of several technologies and strategies;

- Life style changes to ensure deployment of new low carbon technologies and reduction of energy demand.
- Energy efficiency must be enhanced in all sectors.
- Large increase in renewable energy must be ensured.
- Land use change to ensure sustainable forest management.
- Fast deployment of CCS.

While a renewable energy system is the ultimate goal, we do not expect this is to be fully achievable by 2050. From a climate perspective, however, there is hope: Fossil energy can be made close to climate neutral by means of CCS.

The CCS potential

CCS has a large potential for CO₂ emission reduction. If CCS is deployed globally without any delays it can reduce 33 percent of global CO₂ emissions in 2050 compared to emissions

today^[3]. In EU, the potential is more than 50 percent reduction in CO₂ emissions by 2050.

In order to combat global warming it is a prerequisite that the full CCS potential is realized. That means failure for a fast and global CCS deployment is not an option. CCS must be commercial available by 2020 and it must be deployed for not only fossil fuelled power plants but also for large industrial sources like refineries and steel, cement and ammonia plants.

Based on IPCC's report^[1] and assuming a successful global agreement on reducing greenhouse gas emissions at the UNFCCC climate conference in Copenhagen in 2009, all industry and power generators must adapt to a severely carbon constrained world from 2020 onwards. Building new coal fired power plants after 2020 without CCS will therefore become unlikely, both politically and in terms of public acceptance.

How to make CCS happen

In today's situation, there are three essential prerequisites to realize the full potential for CCS and ensure its deployment from 2020 onwards:

- A legal framework for ensuring safe and environmentally sound storage of CO₂ must be adopted and transposed in all EU Member States.
- The establishment of an EU CCS demonstration programme by 2015 in order to gain industrial experience, introduce economy of scale and reduce costs by 2020.
- A high price of Emission Allowance Units under the ETS combined with clear regulatory framework to ensure a market for CCS post 2020.

Regulatory framework

The first challenge, establishing regulatory framework, is being addressed in the EU as a directive proposal for CO₂ storage will be voted on by the EU council and EU Parliament in December 2008. Approval of the directive proposal is a prerequisite for successful deployment of CCS.

Demonstration programme

Demonstration projects for CCS must include testing of a broad range of technologies and options for capture, transport and storage of CO₂. Furthermore, it is important to include industrial sources and not only power plants to ensure realisation of the full CCS potential. Demonstration projects should also be established in developing countries to ensure technology transfer throughout the world. Demonstration programmes should also include biomass and not only fossil fuels to explore the large theoretical potential for the combination of biomass and CCS ^[2].

The *EU Demonstration Programme* published by ZEP ^[4] is a blueprint of how EU can build 10 to 12 CCS demonstration project by 2015 that includes all the criteria above. Bellona recommends that the European Commission establish economic incentives to carry out the demonstration programme recommended by ZEP.

If industry were left with the total financial burden of building the demonstration projects, they would not be built fast enough to meet the target of commercial available CCS by 2020 ^[4]. The financing of the demonstration programme should therefore be a combination of funding from industry, EU, and Member States ^[5].

It is very important that public money for CCS do not result in reduced public funding for renewable energy. CCS must *not* be in competition with renewables. Using public money for CCS must be followed up by increased public funding of renewable energy.

Creating a market for CCS

By 2020 a market for CCS should be established to ensure that all new power plants and large industrial CO₂ sources are built with CCS.

If and when the cost of implementing CCS becomes lower than the price of buying CO₂ emission permits, then deploying CCS will become commercially attractive. The uncertainty linked to this assumption calls for a regulatory framework in order to ensure timely

development and deployment of CCS. Regulatory clarity has several advantages. It will allow upper level management and decision makers in industry and power sector to prepare the necessary investment streams and establish road maps that can kick-start the industrial ramp-up required to support the CCS industry. Such investments will ensure improved supply chains, skills, infrastructure etc. It will also allow European industry to take a competitive lead in developing capacity to export CCS technologies to other markets.

The aim of the *EU Demonstration Programme* ^[4] is to reduce the CCS cost to 35 to 50 euro per tonne CO₂, which is close to the expected future EU ETS CO₂ quota price. The EU ETS is therefore an early start of a European CCS market, and it can be the starting point of a global CCS.

If the CCS cost becomes lower than the cost of CO₂ emissions there will be a market for CCS. But if this is not the case, further regulations are required. There are two alternatives; emission ceilings and CO₂ certificates.

Emission ceiling, or emission performance standard (EPS), is a regulation that puts an upper limit of CO₂ emissions per kWh produced.

CO₂ certificates are allowances for emitting CO₂. The total number of certificates is set by authorities at EU level, and the certificates can be handed out or auctioned to power companies and industrial stakeholders. Certificates can be traded, and, as such, be an incentive for CCS deployment; the cost of CCS will be balanced by trading of certificates.

The Environmental Committee of the European Parliament has approved a proposal to introduce mandatory CCS for new power plants from 2015. The proposal states that power plants with capacity more than 300 MW and with emissions above 500 gram CO₂ per kWh must have CCS.

The level and timing of this proposal will be counterproductive for wide scale deployment of CCS for the following reasons:

- If the limit is 300 MW, industry might chose to build several small plants instead of one big plant to avoid implementing CCS.

- A 500 gram CO₂ per kWh emission ceiling means that gas power plants do not need to include CCS as they emit 350 gram CO₂ per kWh without CCS.
- Introducing this level from 2015 onwards does not allow for reaping the experience of the demonstration programme.
- It would encourage generators to build more gas-fired capacity which both increases reliance on gas imports (increasing our supply/price risks) and locks in avoidable CO₂ emissions (from the new gas plants or life extensions to coal-fired plant) for years to come.

Instead, Bellona proposes an EPS that will help accelerate the deployment of CCS once the Demonstration programme has been fulfilled. This will demand an EPS that does not discriminate between coal and gas. Adequate time for CCS to become commercially viable must also be given before introducing an EPS.

A fuel neutral EPS limit would need to be set at 150 g CO₂ per kWh. It should be applied to all new power producing installations from 2020 onwards. The estimated increase in the price of Emission Allowance Units under the ETS will in effect work in parallel as an economic incentive for complying with the EPS. In addition, and according to the Commission's proposal, any new plants to be built from the Directive enters into force, i.e. 2010, should be capture ready, which will allow them to introduce CCS by 2020 based on the experience from the demonstration programme in place from 2015.

A review clause should be introduced with a view to assessing the technological achievements made by 2015. In addition, the review clause should also assess the capacity to retrofit CCS technology on existing power plants by 2025

Bellona recommendations

Bellona recommends that the following actions are taken to ensure CCS is commercially available by 2020 and that the full potential for CCS is realised:

- The proposed directive for CO₂ storage must be approved by the European Commission, the European Parliament, and Member States.
- The *EU Demonstration Programme* must be adapted by the European Commission and the Member States as soon as possible.
- The *EU Demonstration Programme* must be carried out. The demonstration projects must be selected in 2009, and financial incentives ensuring they are built must be established in 2009.
- A market for CCS should be established from 2020 based on the EU ETS and additional regulations. The additional regulations can be either emission ceilings or certificates. Further studies are required to determine which works best.
- If emission ceilings are found to be the best incentive to ensure deployment of CCS, the emission ceiling should be as low as possible. Emission ceiling of 150 gram CO₂ per kWh for plants with capacity above 100 MW must be established to ensure a market for CCS in 2020. This should be required for new power plants from 2010 and existing plants from 2020 to avoid lock-in of large capacity of new fossil fuelled power plants without CCS.
- Regulations to ensure deployments of CCS in the EU should be established so that they can easily be transferred to the rest of the world.
- A global agreement of GHG emission reduction will be negotiated at the UNFCCC conference in Copenhagen December 2009. CCS should be included as an emission reduction strategy, and regulations should be adapted to realise the full global CCS potential.

References

- 1 Intergovernmental Panel on Climate Change (IPCC), Climate Change 2007. Synthesis report, IPCC Secretariat, Geneva, Switzerland, November 2007
<http://www.ipcc.ch/ipccreports/ar4-syr.htm>.
- 2 How to Combat Global Warming, Report from the Bellona Foundation. June 2008,
http://www.bellona.no/rapporter/How_to_combat_global_warming
- 3 Aage Stangeland, A model for the CO₂ capture potential, *International Journal of Greenhouse Gas Control*, Vol. 1, 2007, pp 418-429,
http://www.bellona.org/filearchive/fil_Stangeland_-_Bellona_Paper_-_Model_for_CO2_capture_potential.pdf
- 4 EU Demonstration Programme for CO₂ Capture and Storage (CCS), ZEP's proposal. Report from the European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP), November 2008,
<http://www.zero-emissionplatform.eu/website/docs/ETP%20ZEP/EU%20Demonstration%20Programme%20for%20CCS%20-%20ZEP's%20Proposal.pdf>
- 5 E. Hoff, Paying for a decent burial. Funding options for an EU programme for full-scale demonstration of CO₂ capture and storage. Bellona Paper, November 2008.
http://www.bellona.no/filearchive/fil_Paying_for_a_decent_burial.pdf