Zero emissions platform

# CCS in Europe

## Maintaining the momentum to deliver energy, climate *and* societal goals

November 2013

European Technology Platform for Zero Emission Fossil Fuel Power Plants

## 1. CCS will play a critical role in meeting Europe's energy, climate *and* societal goals

Europe cannot be decarbonised cost-effectively – *and* maintain security of energy supply – without $CO_2$ Capture and Storage (CCS). CCS is therefore "vital for meeting the Union's greenhouse gas reduction targets"[1] and will have to be widely applied "from around 2030 onwards",[2] according to the European Commission.

- **CCS will ensure Europe has access to a diverse, cost-effective and reliable energy supply** – which *must* include fossil fuels – while meeting Europe´s climate goals. Indeed, CCS will complement the large-scale deployment of intermittent renewable energy with low-carbon baseload *and* balancing generation, as part of a fully integrated energy system.

- **CCS clusters will create thousands of skilled jobs** throughout the entire economy – from engineering to manufacturing to operations management and many other specialist roles. Clusters could also generate an economic impact totalling billions of euros as early as 2030[3] – along with the potential to export valuable know-how worldwide.

- **CCS will also preserve thousands of jobs in industries *beyond* power**[4] such as iron, steel, cement, refining. In fact, in some sectors, CCS is the *only* means of achieving deep emission cuts. Energy-intensive industries are the backbone of manufacturing value chains for both traditional and emerging technologies – including renewable energy.

- **Bio-CCS[5] is the only large-scale technology that can *remove* $CO_2$ from the atmosphere** – in both power and industrial sectors – and is already being deployed at industrial scale in the US.[6] When combined with sustainably sourced biomass, it means CCS can actually move beyond zero emissions to deliver net *negative* emissions.

- **CCS must therefore account for ~20-30%[2] of the EU's total $CO_2$ reductions by 2050** in the power sector, while industrial applications are expected to account for half of the global emissions cuts required by 2050 from CCS.[8] To put this into perspective: an average 900 MW CCS coal-fired power plant (operated in baseload) can abate ~5 million tonnes of $CO_2$ a year[7] – equivalent to ~1,000 wind turbines. Even a 10-year delay in CCS deployment will increase the global costs of decarbonising the power sector alone by €750 billion.[8]

But the window of opportunity is vanishing fast. In order for CCS to be widely deployed by 2030 – and deliver EU climate targets – the following is urgently required:

- A solid business case for CCS and sufficient large-scale demonstration between now and 2025 in order to achieve commercial availability.

- An infrastructure development plan: $CO_2$ transport and storage infrastructure is not yet available and legislation to enable it is not in place in most Member States.

- Innovative business models which align commercial interests along the entire CCS value chain – including a clear business case for $CO_2$ storage.

- Political commitment and public support, which should also follow CCS demonstration as it is seen that $CO_2$ storage is both safe and effective.

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[1] http://ec.europa.eu/energy/coal/ccs_en.htm
[2] http://ec.europa.eu/energy/energy2020/roadmap/doc/com_2011_8852_en.pdf
[3] www.co2sense.co.uk/files/2113/5031/6058/CCS_CO2Sense_Exec_summary_FINAL.pdf
[4] See ZEP's report: "CCS in energy-intensive industries: an indispensable route to an EU low-carbon economy": www.zeroemissionsplatform.eu/library/publication/222-ccsotherind.html
[5] See "Biomass with $CO_2$ Capture and Storage (Bio-CCS) – The way forward for Europe", published by ZEP and the European Biofuels Technology Platform, 2012: www.zeroemissionsplatform.eu/library/publication/206-biomass-with-co2-capture-and-storage-bio-ccs- the-way-forward-for-europe.html
[6] The ADM bioethanol-CCS project
[7] New build coal CCS plant compared to a new build unabated coal plant
[8] International Energy Agency (IEA)

## 2. CCS demonstration is essential to achieve commercial availability *and* public support

While EU policy currently offers targeted support (e.g. feed-in tariffs) to renewable energy sources, CCS has had to rely solely on the EU ETS. ZEP certainly believes the ETS to be the most cost-efficient mechanism for driving decarbonisation in the long term, but the price of Emission Unit Allowances (EUAs) has fallen to a level where, in the short term, it provides no incentive to invest.

Structural reform of the ETS is therefore urgently required – in particular, setting a tighter cap out to 2030 and beyond, as part of a holistic EU Energy and Climate Policy framework. However, even if action is taken now, it will still not result in EUA prices that are high and robust enough to deploy CCS in time to meet EU climate targets.

Europe has therefore not yet delivered CCS demonstration due to the lack of a solid business case and the lack of a level playing field with renewables. Funding schemes such as the NER300 and EEPR have failed to compensate as grants need to cover both capex and opex – and ensure CCS plants are dispatched *over the lifetime of the project*, i.e. whenever CCS-based power production is available to the market.

However, viable projects are still being actively progressed in several European countries. **Transitional support measures for CCS demonstration and early deployment projects are therefore urgently required**. The goal: to provide a robust, predictable revenue stream and an appropriate level of return for investors. Such measures should not only cover power production (lignite, coal, biomass and gas), but also energy-intensive industries, such as steel, cement, refining and petrochemicals.

In addition to demonstration, ongoing R&D (Horizon 2020) is also needed in order to accelerate next-generation capture technologies, drive down costs and prove sufficient storage capacity in Europe.

## 3. $CO_2$ transport and storage infrastructure: the foundation for wide-scale deployment

There is no question that CCS can deliver: in Europe, billions of euros have been invested in CCS by industry and plants such as Sleipner and Snøhvit in Norway are already storing ~1.7 million tonnes of $CO_2$ a year. However, in order to advance deployment, $CO_2$ transport and storage infrastructure must be urgently addressed.

ZEP is therefore developing business models for transport[9] and storage infrastructure, with a focus on the North Sea as a key opportunity for early deployment. Indeed, CCS clusters and networks, where different $CO_2$ sources share both pipelines and storage sites, will deliver significant economies of scale. However, with lead times of 6-10 years, early strategic planning is vital – ahead of wide-scale deployment. ZEP will identify the key enablers for operators to store captured $CO_2$ from third parties on a commercial basis and present viable business models for $CO_2$ storage in the demonstration, pre-commercial and commercial stages, based on these enablers. It is likely that public participation in investments and ownership of a European $CO_2$ transportation grid, with access to offshore storage, will be required.

In anticipation of large-scale CCS projects, up to six new storage pilots should also be established in order to accelerate state-of-the-art technology and increase public confidence in $CO_2$ storage. Public confidence may be further increased by collaborative development on energy storage and $CO_2$ utilisation, such as power to gas.

## 4. Policy actions needed to deliver EU energy and climate goals

Modelling undertaken by ZEP has established that the progressive use of lignite, coal, biomass and gas with CCS between 2030 and 2050 – combined with hydro, wind and solar (and nuclear in specific states) – is the lowest-cost route to decarbonising European power, driven by the ETS.[10] However, this relies on CCS demonstration projects delivering results *before* 2020 so that the next wave of projects can commence from the early 2020s, leading to wide deployment by 2030. Further modelling was therefore

[9] See ZEP's report, "Building a $CO_2$ transport infrastructure for Europe": www.zeroemissionsplatform.eu/library/publication/221-co-2transportinfra.html

[10] See ZEP's report, "$CO_2$ Capture and Storage (CCS) – Recommendations for transitional measures to drive deployment in Europe: www.zeroemissionsplatform.eu/library/publication/240-me2.html

undertaken in order to assess the most effective measures to incentivise CCS demonstration and early deployment projects:

- Feed-in premia (FIPs) offer investors the greatest security of income, a proven method for supporting new low-carbon energy technologies. This is because well-designed FiPs provide support to power plants in a form that best ensures them access to the electricity grid, reducing both revenue risk and price risk for investors.

- CCS certificates are a potential option, but require careful design. ZEP recognises that when considering this option, specific issues have to be addressed, such as the high transaction costs incurred in setting up the system, while the market for such a small volume could be open to competitive misbehaviour.

- An emission performance standard (EPS) will not incentivise CCS in Europe in the short term. If an EPS is set at 450g/kWh in 2030, the effect in 2025 does not advance early CCS, while the effect in 2050 is small. However, if an EPS is set at an appropriately low level, following commercial availability by 2030, it will have a positive effect on CCS deployment.

ZEP therefore recommends the following policy actions to deliver EU energy and climate goals for 2030:

- In response to the Commission's Communication on CCS and Green Paper, **CCS must be fully integrated into an EU 2030 Energy and Climate Policy Framework** in order to provide a long-term price signal for investors – ZEP calls on the Commission and the Ministers to work together for an early agreement. This should be coordinated with the structural reform of the ETS, with draft legislation ready by the end of 2013. Member States should then be encouraged to develop roadmaps and national strategies for achieving clear decarbonisation targets.

- **The amendment to the London Protocol must be ratified** as a matter of urgency in order to allow cross-border $CO_2$ transport and subsea storage for relevant Member States. Pending these ratifications, ZEP supports the IEA's working paper on options under international law to enable transboundary movement of $CO_2$ for sub seabed storage.[11]

- **A revision of the 'CCS Directive'** (2009/31/EC), which currently imposes unreasonable – and unnecessary – burdens, risks and uncertainties on storage providers that are hampering investment. ZEP is also concerned that some Member States that have transposed the Directive have introduced hurdles and show-stoppers that virtually paralyse deployment. ZEP has identified a number of issues, together with potential solutions, which should be addressed in the review of the Directive, scheduled for 2015 – in particular, requirements under financial liability, the transfer of responsibility and third party access.

To this end, dialogue with the European Commission, European Parliament and Member State governments must be intensified to ensure recommendations receive political support.

**The Zero Emissions Platform (ZEP)**

Founded in 2005, the Zero Emissions Platform (ZEP) is focused on CCS as a critical technology for achieving Europe's energy, climate and societal goals. A coalition of over 200 members from 19 countries – representing academics, scientists, European utilities, petroleum companies, equipment suppliers and environmental NGOs – ZEP serves as an advisor to the European Commission on the research, demonstration and deployment of CCS.

www.zeroemissionsplatform.eu



[11] www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf