European Commission
Directorate General Energy
Unit C1 – Renewables and CCS
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Consultative Communication on the Future of Carbon Capture and Storage in Europe

Zero Emissions Resource Organisation (ZERO) appreciates this important initiative taken by the European Commision in the Consultative Communication on The Future of Carbon Capture and Storage in Europe. It is crucial to improve CCS policy and we welcome this opportunity to contribute with inputs regarding a framework for an EU CCS policy.

CCS has its natural place in the tool box for EUs future low carbon society. We need a common perspective on the whole energy system, enabling CCS as climate solution together with other technologies in the decarbonisation of the EU.

For CCS to succeed it is essential to see beyond ETS and introduce new mechanisms that can ensure a cost-effective long term development of CCS. The EU's ability to decarbonize over the coming decades, according to the roadmap 2050, depends on clear and predictable incentives for the European energy and industrial sectors. We need specified instruments that can deploy CCS projects, - both as standalone mechanisms, and as a broader system of several complementing mechanism.

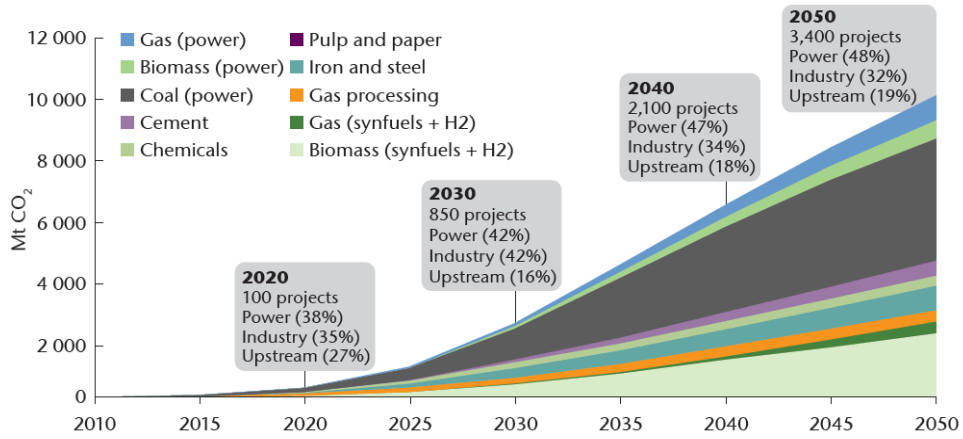
Zero recommends:

- A mandatory CCS certificate system.
- Obligate fossil fuel suppliers to have an incremental share of CCS as part of their fossil fuel volume. – If you take carbon up, you have the obligation to put it back.
- Combine the certificate system with regulation for emission standard (EPS)

Background

Capture and storage of CO2 from major emission sources are important measures for mitigating the climate challenge. Many representatives from science, politics and NGOs have pointed to the fact that achieving the 2degree-target will be impossible without the use of CCS within energy production and industry. Several analyses of the global carbon budget claim that negative emissions from CCS on biomass plants are also needed[1]. Despite the urgency, the development of CCS projects worldwide is discouraging.

The International Energy Agency (IEA) has called CCS a fundamentally important technology to reduce global CO2 emissions and avoid dangerous anthropogenic climate change. According to the IEA's 2009 CCS Roadmap, 100 full-scale facilities are required by 2020 in order for implementation of CCS to proceed quickly enough and on a scale large enough to handle its share of the necessary emission cuts.



Newer figures from the IEA WEO 2012, indicates 7,8 Gt CCS in 2050 and scenarios presented by the IPCC (2011) prescribes the use of CCS with storage of up to 720 Gt even in their no-CCS scenarios in order to achieve the 450 ppm target. The IEA have previously underestimated the penetration of renewable energy in their scenarios as well as the cost of renewables. We hope this will be the case again and the renewable implementation will be higher than IEA scenario shows. But even then, a very large amount of CO2 emissions from fossil fuel and industry will have CCS as the only realistic mitigation option the next decades.

The report from the IEA and the GCCSI in April 2012[2] states that CCS deployment will not happen without additional demonstration funding and policy incentives for deployment beyond demonstration, including strong and credible emission reduction policies

[1] For instance: UNEP (2010) The Emission Gap Report, http://www.unep.org/publications/ebooks/emissionsgapreport/
[2] Tracking Progress in Carbon Capture and Storage. International Energy Agency/Global CCS Institute report to the third Clean Energy Ministerial, April 2012. ...»

Considerable improvements in framework conditions are therefore required to build CCS on the necessary scale.

CCS as part of the decarbonisation of EU

Upfront of the choice of a policy instrument, a sincere CCS policy must take the renewable development into account. The deployment of renewable energies worldwide has increased rapidly in recent years, backed by favourable support mechanisms and larger acceptance in the population as well as a lowering of costs. The deployment has been especially successful in the electricity sector, where wind and solar accounts for the major share of new production capacity. The share of total capacity made up by the renewables is continuously growing and in 2012 they made up over half of net additions to electric generating capacity[3].

Zero welcomes this as an indispensable part of a worldwide decarbonisation. CCS plants in the power sector must therefore adjust to changing dynamics in the power sector.

In 2012, renewable energy shares in the power sector worldwide reached new heights: In Germany, 23% of total power production was covered by renewable sources. Denmark covered 40% of its power production in 2011 by renewable production, mainly on- and offshore wind energy[4]. This trend will only become stronger with decreasing cost levels for renewable energy and several countries taken ambitious targets for the coming years.

This development gives reason to question if we really need carbon capture, especially in the power market. The global technical potential of renewable sources is not the limiting factor for further growth in the use of renewable energy. There is also reason to believe that the cost decline will continue. Despite this, several other aspects points towards a continued effort for CCS also in the power sector.

Renewable energy is facing several barriers that prevent a full use of its potential. In many areas, lack of free and suitable area for installation of new renewable energy production and adequate grid capacity is preventing such investments. Further on, recent investments in coal or gas fired power plants, might give CCS a better business case than renewable energy. In cases where industry depends on highly secure electricity supply, dedicated power plants might be the best option.

In the European power market, the price is decided at the power exchange according to supply and demand mechanisms. Experiences from recent years show that in periods with high (or even 100%) renewable production, prices drop to zero or even become negative[5]. As the share of renewable increases further, it creates a system where predictability and likely investment profitability for fossil operators gradually disappears.

A power system consisting of large shares of intermittent energy production results in new demands for balancing power and storage capacity. There are several options for resolving these new requirements, including hydro storage in mountainous regions, power-to-gas technologies (for example hydrogen), large-scale grid deployment, new and increased battery installations and the

[3] http://www.ren21.org/REN21Activities/GlobalStatusReport.aspx
[4] http://www.ens.dk/da-DK/Info/TalOgKort/Statistik_og_noegletal/Noegletal/Samlet_energiproduktion_forbrug/Sider/Forside.aspx
[5] Operators are thus being paid for taking load out of the grid.

usage of fossil power stations as back-up and balancing capacity. Predictions of annual loads of fossil power stations in a renewable dominated system vary. The important fact is that it remains to give a clear description of the future power marked and future business cases for fossil power plants. This must be taken in to account when analysing various instruments for CCS.

The Emission Trading System

The EU ETS has been successful in establishing a cap & trade system. The emissions are now below the cap, but this is driven by a financial backdrop and a successful renewable energy policy in some member states, in combination with a too high cap. Large amount of surplus allowances from previous phases has contributed to very low prices (below €5/t CO2) and few mitigation investments. Estimates have been made that foresees an excess of 2.2 billion allowances by 2020[6]. So far the EU doesn't look able to get a political majority to do a major adjustment of the amount of quotas available within the cap.

The ETS should be re-structured and the cap should be cut substantially in line with the 2C target.

The practical experiences from the EU ETS have shown that it is unlikely that the cap and trade system will be designed tight enough to provide a high and stable carbon price. Supplementary instruments such as a guaranteed minimum price on CO2, can contribute to resolve the problem of investment uncertainty.

ETS as a standalone system has the disadvantage of not triggering investments to implement higher cost long-term step change technologies. In the midterm perspective, for the technology up-scaling of CCS, ETS will realistically not be the trigger.

Another disadvantage with an ETS is that is used as an argument against any other policy instruments for emission reductions, based on the assumption that any efforts for emission reduction will have no effect since the total emission level is set by the cap. Any emission reductions will therefore be offset by an increase somewhere else within the cap. ETS is not only preventing the needed scale for CCS, but also contributing to block other instruments to make that happen.

Policy instruments for large scale CCS

The CCS technology is ready deployment but is being held back by market and regulatory conditions; concerted policy intervention holds the key to its future prospects. Without limits for emissions or a emissions price – be it direct or indirect – there is no real need for markets to gravitate toward a technology that is specifically targeted toward reducing carbon emissions.

Regulations mandating or providing a pathway for CCS deployment are necessary. Performance standards for particular types of facilities, for example, can safeguard against market failures and provide a clear pathway for CCS deployment that provides the needed certainty for the large capital investments needed.

[6] Guardian 24.01.2013, http://www.guardian.co.uk/environment/2013/jan/24/eu-carbon-price-crash-record-low

In order to ensure deployment of CCS in a necessary large scale**,** ZERO considers a mix of instruments indispensable. At the core an instrument giving industry sufficient incentive to make business cases for CCS viable triggering investments in implementation and innovation. For industry to embark on large scale investments policy instruments needs to be clear and predictable long term.

ZERO has conducted an analysis for policy instruments for large scale CCS this spring. We have assessed seven policy instruments: Government funding, investment funding via market mechanisms (NER300), feed-in tariffs, certificate system, emission performance standard (EPS), carbon tax and emission-trading system.

Our conclusion is a combination of a certificate system and EPS to combine a clear regulation and a cost sharing instrument. This is in line with the proposal b and c in the communication.

We recommend designing the CCS instruments for all large emissions sources, common for both power and industry sources. Here we go a bit into details for these two recommended instruments. In addition we shortly present the main moments for the other policy instruments that we have analyzed. For further reading, se our report[7].

CCS certificate system

The major advantages with the certificate system is that politicians are setting a law binding target for volume, and making a mandatory obligation for companies to fulfil this as a share of their production. Leaving flexibility to companies to find most cost efficient way to deploy CCS, to build CCS themself to fulfil their obligation, cooperate with others for large CCS projects or buy/sell certificates. Placing the certificate obligation at suppliers of fossil fuels, will make the abatement cost for carbon included in the product price for fossil fuels.

Certificate system has so far been in use with success for renewable energy in the power market, for the common system in Sweden and Norway.

The long term predictability for the volume and the free competition between projects, are factors which help to pick the most cost-efficient projects and to bring costs down.

Placing the cost for the CCS in the fossil value chain will strongly incentivize marked actors in the upstream and mining sector to develop safe CO2 storage. By doing so, the industry would be allocated the certificates necessary to secure continued sale of their products. This strong incentive would be good to make use of the competence already excisting in these sectors, including geology expertise. And for allocating investments from this industry to ensure large scale implementation of CCS.

Certificate system are political attractive for its efficiency to ensure political goal. A cost sharing model is positive for carbon leakage issues, which is important for political support. It is more likely to get political acceptance when cost are covered by the industry and included in the product price for fossil fuels, than if the cost is to be added directly to consumers. The global pricing of oil and gas can make it difficult to increase prices towards customers.

[7] Policy instruments for large scale CCS. ZERO, July 2013 (coming soon)

A certificate system can easily work together with a quota system, as the volume of CO2 reduction from the CCS certificates is politically set and the same amount can be withdrawn from the ETS market.

A certificate system should be implemented as soon as possible. A progressive escalation of certificate obligations, setting the amount for each year, should be used both for the early phase of ramp-up for CCS-projects in line with the 2C target.

A more detailed describes for a proposal for a CCS certificate system in Europe is in the appendix: "How to design a certificate system for large scale CCS" attached.

Emission Performance Standard (EPS)

EPS is a very clear regulation and market condition representing stable predictable framework for industry. The market message is clear to the companies; to invest in solutions to meet the standard. The instrument is not technology specific for CCS, so it will give a competition between all technologies to meet the standard in the most cost efficient way (as renewable biomass technologies).

EPS has proven good effect for pollution control as for NOx. On CO2 EPS was introduced in California in 2006, in Canada in 2012, and has been proposed in several other states and regions. These regulations have been valid for new power plants with benchmarks at 400-450g/kWh. In Canada the EPS obligation is also introduced for old plants that have reached their end-of-useful-life. In effect, the regulation means a prohibition of new coal power plants without CCS. For Canada, the EPS was one of the factors that led to the building of the first CCS projects on coal, at Boundary Dam, even before the EPS was formally implemented.

Regarding carbon leakage, the combination with a certificate system and other policy instruments for renewable energy, will remove/reduce the potential risk for carbon leakage. In addition, two policy options can be applied for this connecting to EPS:

One is a carbon border import standard, setting the same demand for the imported products as the EPS inside the country/region. This is the case for the Californian EPS also regulating imported electricity from neighbour states. The same system is implemented in California for fuel by the Low carbon fuel standard, setting emission performance standard on fuels, including the emissions from also foreign production. EPS applied for industry productions may be regulated the same way on e.g. import of cement and steel.

Another way is to get an international sectored agreement, committing participating countries to adopt common standards for greenhouse-gas emissions from a specific sector, with oil refineries, iron, and steel and cement industry as good candidates to start with.

EPS should be implemented at sufficient low emissions levels in line with the climate goals, to exclude new convential fossil fuel plant, both for coal and gas, and include also a plan for existing power plants and general industry.

Other policy instruments

Government funding

In general, government funding processes are limited both in terms of money and the time period in which it is possible to apply for support. The result from the process can be no support and a failed project. This increases planning costs and can reduce the likelihood of companies making large investments in planning and technology development.

Rather than providing investment support, the most valuable contribution Governments can make is to facilitate storage sites and assume long term liability. Given that long term liability is an essential barrier to CCS deployment with the current legislation, the relocation of responsibility for long term storage from the companies to the Government could be the most efficient way Governments could contribute to make CCS happen.

Investment funding via market mechanisms (NER300)

NER300 has not been successful in realising CCS in Europe, regards to the policy goals of 10-12 large scale demo plants by 2015. The reduced price for allowances has reduced the value of the fund substantially. The NER300 competition has indicated that few companies have the appetite to cover the cost for project development up to the stage of application without larger certainty of getting support and being able to fulfil the project. Large projects and large economical support can result in long and complex time consuming start and stop process.

Feed-in tariffs (FIT)

Based on the success of FIT for renewables, it is possible to conclude that FIT for CCS can ensure large-scale implementation if designed correctly. Theoretically, the FIT system has its primary strength in stimulating the learning phase of a new technology, in boosting the learning curve and reducing costs to boost market competitiveness. Still, there is a large risk for under- or overcompensation, which may be harder to adjust for CCS compared to renewable energy because of fewer and larger projects. The disadvantage of FIT regarding ensuring needed scale is that the penetration of abatement technologies will depend on the right price level for the tariff, and the volume is uncertain.

CO2 Tax

Even though a carbon tax and ETS theoretically provides emissions reduction for the lowest costs, it does not promote technology development for step change technologies with higher initial costs. For the renewable deployment in Europe, national renewable policies have been crucial, not CO2- tax or ETS (for more on ETS see dedicated part above)

If a high tax is introduced in one country/region the extra cost for industry can result in moving production. The level of the emission tax triggering leakage will vary for different types of industry, locations, and other policy framework for industry production. The competitiveness for the industry and carbon leakage issues is a major political argument against national CO2 taxes, and pro global CO2 tax. A global CO2 tax is not very likely to happen. Regional CO2 tax regimes and internationally linked tax level between some countries might be a more realistic option.

A way of coping with this problem would be to introduce border carbon adjustment (BCA) for CO2 emissions. Border tax adjustments are standard in value added tax (VAT) regimes in the world, and would be viable in a carbon tax regime as well. If an appropriately sized carbon tax is setwith BCA it can ensure large scale CO2 abatement including CCS. A CO2 tax at low/medium level alone will not give sufficient incentive to do CCS though, but can for ex. cover of operation cost together with other instruments.

Barriers for the CCS in the EU

The ENGO Network on CCS, where ZERO is one of 10 members, has written papers and blogs where potential barriers for CCS, and means for improved public understanding and recognition of CCS is treated. [8]

A comprehensive climate policy

The single biggest barrier standing in the way of CCS deployment is the absence of comprehensive climate policies that place a significant value on avoided emissions. Without such policies and legislation, economic drivers for CCS are simply lacking, as there is little other reason to capture and sequester carbon, with the exception of niche applications such as EOR. Many utilities are presently backing away from developing CCS projects as a result of the economic crisis and the lack of policy instrument to make business case viable

Needed diffusion of know-how, especially on storage

Although economic and regulatory barriers constitute the majority of the impediments for CCS, another area bears examining. This is the interface between the more risk averse producers of the CO2 – mainly power producers – and those who will be injecting the CO2 into the subsurface – mainly the more risk experienced oil and gas and related companies in the early years. The bulk of expertise related to CO2 injection resides with the oil-and-gas industry, with little diffusion of experience and know-how to the power sector.

Distrust and lack of knowledge

In addition, the lack of CCS education and a long standing mistrust of the coal and oil industries by the public in some settings, have also limited broader support for accelerated deployment policies, driven by doubts on the feasibility and efficacy of geological storage and with CCS being seen as a means to perpetuate fossil fuel use. Politically or otherwise-driven industry claims that CCS is unproven only compound this scepticism, and even environmental groups that see a role for CCS alongside solutions such as conservation and renewable energy, find themselves with a formidable task when it comes to education and shaping public perception.

We need to show that globally CCS projects have existed for decades and that there are full scale project being built now. [9]

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[8] http://www.engonetwork.org/engo_perspectives_on_ccs_digital_version.pdf
http://www.engonetwork.org/Moving_CCS_Forward_in_Europe_May_24.pdf
http://www.engonetwork.org/Blog.html?entry=an-ngo-perspective-on-ccs

[9] http://www.zeroco2.no/projects

Cost

Another barrier for its adoption today is the price premium that it entails. Cost improvements are expected once serious deployment begins, but the disadvantage for the early mover can be more technology and cost risks. Governments have a pivotal role to play in enabling CCS deployment through complementary policies.

A better public understanding and knowledge on CCS

More focus on industry and gas

If CCS is to move forward in key member states such as Germany, it will be necessary to inform NGOs and citizen groups that CCS can clearly form part of a low-carbon future. This is more clearly the case for the use of CCS on industrial sources of CO2 emissions or on gas-fired power plants. Such an approach would also appeal to politicians who are concerned by the impact of the economic crisis and the risk of carbon leakage and job losses. A positive motivation for CCS is sorely needed to counteract the negative perceptions of CCS to date.

A positive message on added value

CCS is about adding value to industry, making steel production more efficient as well as reducing emissions, for example. CCS is about taking emissions out of the atmosphere, permanently sequestering the CO2 captured by biomass in geological formations. CCS can also offer flexibility and do more with less: producing hydrogen or feedstocks for chemicals in the same plant that produces electricity for the grid to balance the peaks and troughs of renewables. CCS can be a job retention technology for Europe's manufacturing industries, refineries, cement plants and chemical producers. A low–carbon Europe is only achievable with CCS or the counter-productive offshoring of thousands of jobs.

Showing leadership and action force

The CCS sector must decide whether it wishes to wholeheartedly engage with a vision of Europe transitioning to a low–carbon economy. It will not suffice to sit on the sidelines with sceptics. If the CCS sector can grasp this challenge, it can then start to identify plausible roles for CCS in 2030.

From this it can work backward to determine the types of investment that make most sense now as either enduring requirements or necessary catalytic actions. In doing so, it needs to set out how CCS adds value to the European economy and energy system. This needs to be considered in a far broader sense than simply the efficiency of investment pathways. It must encompass social concerns about the impacts of transition and identify how CCS can unlock political support for continued action on climate change.

Earnest and committed messaging

The economic crisis and growth of renewables have undermined the business model for new coal plants. The gas sector has sought to fill the gap, but has yet to seriously address the need for CCS. It is in its own interest to do so if it wants to secure a long-term future. Shale gas or no shale gas, the gas sector needs to be resolute in its support for a low–carbon economy, or risk receiving the same kind of direct action opposition that has taken chunks out of the coal industry. It has the skills to provide

cradle-to-grave management of CO2 emissions. It should get to work on making the business case stack up, including by proactively supporting pro-CCS policies.