

Alstom's response to the European Commission's consultation on Carbon Capture and Storage

Alstom is a global equipment and services supplier to the power generation, power transmission and rail transport sectors. Through its innovative technologies, the Group contributes to improving energy efficiency, reducing CO₂ emissions and developing renewable sources of energy, in line with the objectives of the EU energy and climate package for 2020.

A leading technology developer for CO₂ capture and storage (CCS) and usage (CCU), Alstom welcomes the launch of the Consultation on Carbon Capture and Storage as an evidence of the European Union's commitment to help, through strong enabling policies, unlock, drive and support, the investments decisively needed to deploy CCS technology in Europe, both for power plants and industry.

In the medium term, CO₂ utilisation in the Chemical and Oil & Gas sectors could also offer interesting spin-off opportunities. For example, CO₂ has long been utilised to extend the production life of oil fields particularly in North America where demand for CO₂ is increasing. In addition, CO₂ is also used in the production of several chemicals and chemical intermediates where carbon pricing is leading many producers to re-evaluate their carbon management strategies, including the recovery of emitted CO₂.

- ***Alstom is a leading CO₂ capture technology developer***

In CCS, Alstom focuses mainly on post-combustion and oxy-combustion technologies as these applications cover both new build power plants and the existing installed base.

- Post-combustion capture technology separates CO₂ from the exhaust gases using a solvent. Alstom has prioritised two technologies: advanced amines and chilled ammonia. These technologies can be applied to both coal-fired and combined cycle gas-fired power plants.
- The oxy-combustion method burns the fuel in a mixture of oxygen and recycled CO₂ instead of air. This combustion produces a concentrated stream of CO₂ that can be easily separated for subsequent storage.
- Second generation technologies, such as chemical looping combustion and regenerative calcium cycle are also being looked at because they offer the prospect of additional future benefits.
- Pilot and demonstration projects: four units have completed tests in the USA and Europe. Nine units are in operation or in commissioning using oxy-combustion, chilled ammonia, advanced amines or second generation technologies.
- Alstom has been participating in the development of several large-scale CCS demonstration projects, notably in China, Romania, Poland, USA, Canada and the UK. In particular, in the UK, the White Rose CCS Project (a new 426 MWe high efficiency coal-fired power plant, to operate in oxy-combustion mode, capturing and storing ~2Mt CO₂/y), developed in partnership with Drax Power, BOC-Linde and National Grid Carbon, was selected as one of the two preferred bidders by the Department of Energy and Climate Change to receive capital grant funding as part of the UK CCS Commercialisation programme; market support in the form of Contract for Difference is also foreseen on this project through the Electricity Market Reform.



- ***CCS is a key component of a cost effective decarbonisation of the power and industry sectors***

According to IEA (Energy Technology Perspective, 2012), “delaying or abandoning CCS as a mitigation option in electricity generation will increase the investment required in electricity generation by 40% or more (2DS scenario) and may place untenable demands on other emissions reduction options”.

Despite the initial ambition of the EU to have 12 large scale CCS demonstration projects in the EU in 2015, no one has been able to take Final Investment Decision (FID) so far. The lack of progress on CCS in the EU, and the rapid progress made in this area elsewhere in the world (USA, Canada, and China) shows urgent action is needed.

- ***CCS crucially needs to be fully integrated in the EU 2030 Energy and Climate Policy framework.***

The European Commission is running two consultations at the same time: on the green paper on 2030 framework for climate and energy policies and on Carbon Capture and Storage. CCS will be an indispensable technology if Europe is to maintain and increase industrial production, improve its low-carbon competitiveness and retain skilled jobs. It is of utmost importance that these 2 processes converge in order that EU’s 2030 climate and energy package includes specific and detailed actions on CCS.

As part of the EU 2030 Climate and Energy framework, **Alstom supports the set of a binding CCS target in terms of CO₂ avoided that covers both the power and industry sectors.** This CCS target set up should be supported by the development of an **EU CCS Roadmap**, which will assess concrete measures of deploying CCS, to be then further analysed and developed at Member State level.

The EU must agree on 2030 objectives and targets as soon as possible and in any case before the UNFCCC international climate negotiations to be held in 2015 in Paris (COP 21). This timeliness will ensure the indispensable visibility needed to trigger the necessary long-term investments in infrastructure, and namely in CCS.

- ***Visibility of the expected revenue stream is the key element to unlock investments in CCS.***

Whilst a robust CO₂ price would act to disincentivize investments in unabated fossil-fuel power plants and industrial units, positive market support together with long term visibility and predictability of expected revenues is needed to incentivize the commercialisation of low-carbon technologies.

Feed-in tariffs can provide investors in the short and medium term with the needed visibility on the price of electricity, and therefore clarity on their return on investment. EU should encourage such positive incentive to be implemented at Member State’s level for CCS, following the example of the Electricity Market Reform in the UK where, the government plans to set Contracts for Difference for CCS and other low carbon technologies.

A CCS certificate system is another form of support that could bring a direct revenue stream to CCS projects. Related design and level of application should however be carefully assessed.

Critically, CCS should be treated on a level playing field with other low carbon technologies (i.e. Renewables), so that CCS is ultimately able to compete with other technologies when the market will be decarbonised.

- 1) **Should Member States that currently have a high share of coal and gas in their energy mix as well as in industrial processes, and that have not yet done so, be required to:**
 - a. **Develop a clear roadmap on how to restructure their electricity generation sector towards non-carbon emitting fuels (nuclear or renewables) by 2050,**
 - b. **Develop a national strategy to prepare for the deployment of CCS technology.**

In 2010, Member States have been required to submit national renewable energy Action Plans (Article 4 of Directive 2009/28/EC on Renewable Energy). These plans provide detailed roadmaps of how each Member State expects to reach its legally binding 2020 target for the share of renewable energy in their final energy consumption. To achieve their national targets, Member States have put in place specific support schemes (Feed in Tariffs, Renewable Obligation Certificates), which have further driven the development of RES. In 2011, the RES share in the final energy consumption of the EU was 13.0% compared to 8.5% in 2005.

In contrast, **the absence of binding targets for Carbon Capture and Storage is certainly one of the key reasons for EU seriously lagging behind today on the deployment of this technology**, despite the Commission acknowledging the vital role of CCS in each of its 5 scenario developed in the “Roadmap for a low carbon economy in 2050”.

Alstom therefore supports a binding CCS target in terms of CO2 avoided to cover both the power and industry sectors. Its implementation should be supported by the design of an EU CCS Roadmap. The EU should ask the Member States to develop a national strategy to prepare for the deployment of CCS technology, the implementation of this binding target and the related EU CCS roadmap.

While the share of renewables will increase in the coming decades, fossil fuels will remain an essential part of the energy mix. Only a balanced portfolio of technologies will allow the EU to reach its decarbonisation objectives, taking into account national energy mixes (93% of Polish electricity is produced from coal), and policies. **It implies that a level playing field is established between CCS and other low carbon technologies.** CCS and renewable energy technologies are by no means mutually exclusive. On the contrary, **CCS complements the renewables’ intermittency by providing flexible low-carbon back-up power**, ensuring a constant and secured energy supply, in line with the objectives of security of supply, environmental sustainability and affordable electricity.

- 2) **How should the ETS be re-structured, so that it could also provide meaningful incentives for CCS deployment?**

On the long term, the EU Emissions Trading Scheme is one of the main tools to achieve the EU’s emissions reduction objectives through an appropriate carbon price signal that would penalize investments in non-abated systems. **But, the carbon price on the EU ETS is far too low (around €4 today) to achieve such a goal. While the “Backloading” is a needed first step measure to “cure” the current over supply of allowances on the EU ETS, it remains a temporary measure.** To strengthen the scheme on the longer term, and ensure a functioning ETS, the European Commission has made six proposals. Among them, Alstom supports:

1. **the set-aside of the to be backloaded allowances, and ;**



2. the set of an ETS cap for 2030 based on an increased annual linear reduction factor of CO2 emissions reduction from 1.74% to 2.5%.

This new cap for 2030, which needs to reflect the expected progress of other climate and energy policies such as Renewables and Energy Efficiency, should be set as soon as possible and **in any case before end 2014 in order to provide the required long term visibility to investors.**

In addition to the Commission's proposal, **Alstom supports the design of a Permanent Adjustment Mechanism – PAM – in the EU ETS.** A volume adjustment mechanism would ensure the efficient functioning of the ETS on the long term and the scarcity needed to unlock and support investment in low carbon technologies. This PAM does not modify the cap once set, but acts as a shock absorber (when the Demand is below Supply, a reserve is built, when Demand exceeds Supply, reserved allowances are put back on the market). *Please refer to Alstom's response to the European Commission's Consultation on Structural Measures to the ETS.*

But the restructuring of the EU ETS will take time and is not adapted to drive CCS deployment. Immediate and direct supporting tools are urgently needed to get CCS over the line to early go to market.

3) Should this be complemented by using instruments based on auctioning revenues, similar to NER300?

The first top priority is to enable the delivery of CCS demonstration plants in Europe. Despite the ambition of the EU to have 12 large scale CCS demonstration projects in the EU in 2015, no one has been able to take Final Investment Decision (FID) so far. The lack of progress on CCS in the EU, and the rapid progress made in this area elsewhere in the world (USA, Canada, and China) shows urgent action is needed. Unfortunately, no CCS project has been able to benefit from the funding available through NER 300 Phase 1 programme. Under budget pressure, several Member States could not confirm the co-financing required, all the more as its level had dramatically increased as the carbon price dropped.

Financing instruments, including those based on auctioning revenue, remain crucial to help demonstration projects to take off the ground, and support the deployment of the project during the "valley of death".

These instruments could be based on the binding earmarking of **100% of the auctioned revenues from the EU ETS to Climate action.** Today, the EU ETS Directive only *recommends* that at least 50 % of the revenues from the EU ETS should be used for climate action. **Alstom would support this threshold to be increased to 100% and made binding,** to make funding available for low carbon technologies including CCS. Annually, part of the revenues could be yearly earmarked to help CCS demonstration or gathered in a **"CCS fund" at the EU level** and allocated to demonstration projects after competitive process (NER 300 - like). Related principle could be described as part of the EU CCS roadmap to be developed.

- 4) **Should the Commission propose other means of support or consider other policy measures to pave the road towards early deployment, by:**
- a. **Support through auctioning recycling or other funding approaches**

- *Recycling the EEPR unspent funds*

Realising CCS demonstration is crucial for advancing research and scientific knowledge in CCS. The funding provided by the programme has been essential for enabling the selected CCS projects to progress as far as they have to date. However, as is the way with early stage capital intensive projects, not all will succeed and of the original six projects, two have been stopped already.

The remaining EEPR CCS projects need public funding support beyond the original EEPR grants to take their Final Investment Decision. Recycling existing funds under the European Economic Programme for Recovery (EEPR) is essential to achieving the development of successful demonstration projects. **Therefore, Alstom supports that unspent EEPR funds are redirected to the CCS projects which could be implemented soon.**

- *Encourage a continuous and sustained support from Norway to CCS demonstration projects in Europe as part of the Norwegian Financial Mechanism.*

As part of the 5 years agreement (2009-2014) signed between Norway and the European Union, Norway has undertaken to contribute to the reduction of economic and social disparities in the European Economic Area. The Norwegian Financial Mechanism provides financial contributions (€160 million per year during 2009-2014) to “priority sectors”. “Carbon Capture and Storage” and “Green Industry Innovation” are 1) and 2) on the list.

Financial support from Norway is critical to support early stages (FEED studies for instance) of CCS demonstration projects. As the start of EU CCS Demonstration program continues to be delayed, it therefore can only be strongly regretted that Norway eventually declined to provide its support to Getica CCS demonstration project (Romania), which remains the only project alive in Central and Eastern Europe. The €40M grant would have allowed the project to perform the FEED studies and take a decisive step towards the development of CCS technology in Europe. Without this financial support, Getica project, which is based on a partnership among EU leading companies, is on hold.

As Norway remains committed to the development of CCS at the national level it should be strongly encouraged to maintain its support to this technology in EU Member States as well.

- *Leverage the financing opportunities from the Coal and Steel Research Fund*

The Research Fund for Coal and Steel, created in 2002 on expiry of the European Coal and Steel Community (ECSC), supports innovative research on coal and steel technologies. Yearly interest on the assets of the ECSC, some €55m/year, is used to fund research projects. The RFCS could benefit directly to CCS technology, i.e.:

- its objectives are enlarged to research and demonstration
- the yearly interests for 2013 are earmarked to the most advanced CCS demonstration project to allow it take Final Investment Decision



- Unlock the RFCS fund so that the assets (circa €1bn) are immediately redirected to CCS demonstration program.

b. An Emission Performance Standard

Alstom does not advocate for the implementation of an Emission Performance Standard at the EU level. An EPS is another tool that disincentivize investments in unabated fossil-fuel power plants and industrial units. It does not provide any of the necessary positive incentive to invest in CCS. In addition, the implementation of an EPS would benefit to technologies which are mature today, which is not the case of CCS. Finally, if wrongly designed, an EPS could allow unabated fossil fuels to continue to operate and create a distortion between fossil-fuels. For instance, the setup of a 450g/Mwh threshold in the UK will allow gas power plants to continue to operate without CCS, destructing the market opportunities for CCS to be installed on coal power plants. If an EPS was envisaged on the medium term, it should only provide threshold fixed below 100-150g/Mwh.

c. A CCS certificate system

Alstom supports national CCS Certificate systems as possible tools to be selected by Members States when implementing their low-carbon strategy. Governments should ensure alignment with eventual renewable certificates to be ultimately removed when markets are decarbonized.

CCS certificates can be an alternate for Member States when a national feed-in tariff or equivalent measure is not chosen as the preferred option.

Such a CCS Certificate system requires to be carefully designed. The following points should be paid attention to:

- The setup of the initial volume and its increase as power plants equipped with CCS come on line. To be implemented, a CCS Certificate scheme implies CCS is commercially available.
- Power plants equipped with CCS should benefit from some form of priority of dispatch on the grid

5) Should energy utilities henceforth be required to install CCS-ready equipment for all new investments (coal and potentially also gas) in order to facilitate the necessary CCS retrofit?

Yes, the energy utilities henceforth be required to install CCS-ready equipment for all new investments (coal and potentially also gas) in order to facilitate the necessary CCS retrofit. Once CCS has been demonstrated technically, and market conditions have been established to make the technology commercially viable, operators should have the incentive to implement CCS as part of their new projects involving fossil-fuels. Until then, measures to ensure CCS-readiness are justified and should apply to both fossil fuel power plants and carbon-intensive industrial installations. Without CCS, power plants and industrial installations risk becoming stranded assets as the economy is decarbonised.

According to Alstom, the "CCS-readiness" as presented in the Directive 2001/80/EC (Article 9a) is not based on strong enough criteria. The revision of the Directive, planned in 2015 as read in Article 38 of the Directive, should clarify the following points:

- Investors and authorities need further clarity on what is required to fulfil the conditions set to availability of storage, the feasibility to establish transport and the requirements to capture readiness.



- If the conditions to CCS readiness are not met, it should be clarified that competent authority shall not grant the power plant operating licence

- Some power plants may be tailored to operate as peak-shavers, with correspondingly low load-factors. To the extent that both investors and the relevant authorities recognise such an operational mode for the plant, CCS-readiness should not be made necessary

Such review could either take place as a part of the review of the Directive 2009/31/EC ('CCS Directive') or as a separate review of the Directive 2001/80/EC (Large Combustion Plants).
