

Introduction

Carbon Capture and Storage (CCS), a variety of processes for extracting CO₂ from large point sources and permanently sequestering it, has been recognised by the European Commission since the 2008 Impact Assessment¹ as an essential part of Europe's low carbon pathway. However, since then progress has been slow. The European Commission is currently reviewing progress on CCS² and Sandbag has responded to selected questions.

Amid problems with the NER300 fund³ (extracted from EU Emissions Trading Scheme auctions), questions over the permanency of storage in geological formations and a lack of incentives for energy suppliers, the expected date for the first-round of CCS plants, 2012, has come and gone. The USA and Canada now have commercial-scale CCS plants operating, and China has announced it will have commercial CCS by 2020. The EU needs to advance R&D and demonstration projects quickly in order to keep pace with developments in other parts of the world and to ensure that decarbonisation is not rendered incompatible with industrial activity. CCS is a vital part of the EU energy mix.

About Sandbag

Sandbag is a UK based not-for-profit organisation campaigning for environmentally effective carbon markets and focusing on the EU Emissions Trading System (ETS).

Our campaigns are supported by in-house research that monitors the environmental robustness of the caps, the distribution of allowances, and how key sectors, installations and companies in the scheme are affected.

For more information visit our website at www.sandbag.org.uk or email us at info@sandbag.org.uk

¹ The 2008 CCS Directive European Commission Impact Assessment http://ec.europa.eu/clima/policies/lowcarbon/ccs/docs/ccs_ia_jan2008_en.pdf

² EU Commission CCS Consultation <http://www.ccs-directive-evaluation.eu/>

³ NER300 funds innovative renewables technology, but not CCS <http://bellona.org/news/ccs/2012-12-first-round-of-ner300-revenues-fail-to-fund-ccs-demonstration>

Recommendations

- CCS is important for power, but also offers a way to decarbonise stubbornly high-emitting industrial sectors (e.g. steel). The review must ensure these sectors are also included.
- Emissions Trading Scheme reform is essential in order to give a stable future carbon price that will allow emitters to make economic decisions on researching, installing and operating CCS.
- Separate CCS support policies for the power and industrial sectors, additional to an improved carbon price.
 - To incentivise CCS for power, additional supporting mechanisms or grants must be provided (e.g. a decarbonisation obligation, EPS, greater NER300 access).⁴
 - To incentivise CCS for industrials, a carbon sequestration certification system funded by fossil fuel extractors. Industrials, insulated as they are from the ETS carbon price by free allocation, will not invest in CCS without alternate policies
- A renewed focus on R&D funding, a step that the original CCS Directive failed to adequately incentivise.
- Investigation of the wider scope of CCS, particularly including mineralisation and productive uses for stored carbon e.g. aggregates

⁴ See Sandbag's briefing: A 2030 Decarbonisation Target
http://www.sandbag.org.uk/site_media/uploads/A_2030_decarbonisation_target_in_Europe_in_the_context_of_low_carbon_price_s_1.pdf

Section A

A1. The original [Impact Assessment for the CCS Directive](#) described a number of objectives for it. Do you think that these objectives are appropriate?

The original objectives did not focus on R&D and failed to encourage the investigation of CCS technologies at small-scale. This leaves a gap in the process to bring commercial CCS to market.

A3. Do you think some of the objectives of the CCS Directive would be better addressed by Member States (MSs) at the national level?

As with other projects, clearance for state aid is needed. Germany, among others, has expressed concern that CCS support breaches state aid guidelines. Clarification of the way government support may be used for CCS is necessary, but it should not interfere with state aid rules as CCS incentives would be technology neutral, as CCS is not a single technology.

Section B

B2. The Impact Assessment completed by the European Commission when the CCS Directive was drafted concluded that the EU Emissions Trading System (ETS) was the right enabling policy for internalising climate change externalities and that there was little evidence of a need for additional measures (going beyond the carbon market). Given the slow rate of progress in CCS to date do you think the European level policy framework needs additional (or less) policy measures to enable the transition to CCS?

Needs additional measures

Comment

The transition to CCS is currently weakened by the failure of the ETS policy to create a clear price signal and consequent lack of pressure on power companies to decarbonise. The ETS currently provides very little incentive, with an almost incidental carbon price. Europe needs to quickly fundamentally reform the market, removing the surplus and implementing an effective Market Stability Reserve to prevent another surplus accumulating. However, putting all policy eggs in one basket would be a mistake as dedicated additional policies are needed to bring less close to market technologies to commercialisation. CCS is perhaps the only way to decarbonise many parts of the industrial sector and needs specific support to ensure that whether the carbon market eventually becomes a driver of emissions cuts or not, this vital technology is not left to flounder throughout this decade.

CCS also has potential outside of power generation. Incentives need to be developed to enable CCS for heavy industry, including metal, cement and chemical production. There must

also be awareness that some forms of CCS can produce a commodity that can be used, for instance carbon neutral aggregate.

B2.1. What is your view of the following potential policy mechanisms to be established at EU level?

- A CO₂ price ramp – driven by a tighter cap: **Strongly support**
- Public grants to subsidise capital costs: **Strongly support**
- Public grants to subsidise operating costs of CCS plants: **DK**
- Public grants to subsidise capital and operating costs of CCS plants: **DK**
- CCS certificates: **Strongly support**
- Emission Performance Standard: **Strongly support**

Comment

Obviously there are a range of possible policy options and further work is needed to determine the best approach. We are surprised the consultation does not consider Feed-in-tariffs, privately-funded from energy companies, rather than public grants. There are also many variations of Emissions Performance Standard. For instance, an EPS can be set at the level of Member States, emitting entities or in the case of power on suppliers of electricity. This later option could be in the form of a Decarbonisation Obligation, a percentage target for the volume of low-carbon technology supplied, which again can be set at these different levels to accommodate different starting points but converging over time. Alternatively a CCS obligation could be placed upstream, regulating extractives to buy a certain number of CCS certificates from projects of their choosing.

Section C

C10. How do you think progress on the uptake of CCS technology in Europe compares with the rest of the world?

- Similar progress
- Europe is leading
- **Europe is a little behind**
- Europe is well behind
- Don't know

C11. Do you think this position will influence the ability of Europe to export CCS technology in the future?

- Improves prospect
- No influence
- **Reduces prospect**
- Don't know

Comment

China has promised commercial CCS before 2020. The USA and Canada have commercial CCS plants. The EU's chance to gain a first-mover advantage on CCS technology and experience is fast slipping away. The original impact assessment foresaw the first plants in 2012, and "some real operating experience should be available by around 2015 which could be used to shape priorities and targets for these 'second tranche' plants." The CCS programme must move quickly to maintain the EU on a par with international competitors.

Section D

D3. Do you think the Directive (Article 33) adequately supports the future implementation of "capture ready" plants in a harmonised way across Europe, e.g. fossil fuel power plants built with the assurance of a future proven CCS retrofit option?

No.

Comment

"Capture-ready" is a concept that amounts to a delaying tactic. The key challenge is not how to make new plant CCS compatible but how to ensure existing plant are replaced by carbon capture plant today. The delaying tactic of "capture-ready" new builds is unlikely to be accepted by the public or to lead to CCS incentivisation.

D4. In light of the slow progress of CCS demonstration in Europe, do you think it is needed, practicable and justifiable to establish mandatory Emission Performance Standard (EPS) requirements for fossil fuel power plants?

Yes

Comment

CCS is just one reason for an EPS. Fuel-switching is plainly not progressing as originally expected in Marginal Abatement Cost curves, with coal remaining stubbornly part of the mix.

The European Commission 2050 roadmap assumes a significant part for CCS from 2020 onwards, growing to cover 30% of demand by 2050 in one scenario. Most standard models require CCS. However, current developments are making these scenarios ever more ambitious, with commercial CCS in Europe still at the drawing board stage. If these scenarios are to be borne out, CCS application needs urgent encouragement. Some form of regulatory intervention is needed to supplement the failing ETS. A Decarbonisation Obligation or mandatory EPS could be what is needed. An EPS on power generators or on suppliers is practicable, using existing information on g/kWh of carbon; and increasingly justifiable, with

some Member States implementing their own EPS (e.g. the UK) and the USA EPA taking a similar route. A separate policy mechanism may however be required for industrial CCS.

A Decarbonisation Obligation or EPS also has the effect of stimulating the assumed first step of the Marginal Abatement Cost Curve, triggering fuel switching (from lignite to bituminous, or from coal to gas). This is vital as Member States see emissions rise even as renewables begin to take a significant part of demand (see Sandbag's report: *Europe's failure to tackle coal*⁵).

The case for an EPS is further justified by other events: the European Investment Bank recently introduced an 550 gCO₂/kWh emissions performance limit for construction of coal plants, as noted in European Parliament implementation report of 14 January 2014 on developing and applying carbon capture and storage technology in Europe (2013/2079(INI)). It also emphasised that without the financial support to develop CCS, the introduction of stringent emissions performance standards becomes essential. The CO₂ Storage Directive already features a review in 2015 to consider whether an EU-wide EPS might be required. In 2008, the European Parliament ENVI committee supported the principle of an EPS for new power plants constructed in the EU (though it was rejected by the Council). Parliament may maintain that appetite and, as MS policy begins to fragment, Council may join them. It is also worth remembering that the ETS replaced a mandatory requirement in the Integrated Pollution Prevention and Control Directive to improved efficiency. As the EU considers a further energy efficiency target for 2030 it should look again at how to ensure efficiency in the power and industrial sectors is secured in the absence of a relevant carbon price. In the power sector huge efficiency gains are possible through the closing of old coal stations.

D5. Do you think that mandatory EPS runs the risk of having conflicting objectives with emissions trading, which could in turn have negative consequences for CCS?

No

Comment

Emissions Trading Scheme (ETS) reform is not guaranteed and has previously floundered. Also, even with ETS reform, it may be that a high enough carbon price for coal-to-gas switching would be politically unfeasible given the costs it could add to domestic and industrial energy bills. Complementary and backup policies such as a Decarbonisation Obligation or EPS can serve as a backstop to mid-term EU decarbonisation. The International Energy Agency agrees that, despite the risks, there is a need for non-price measures to work in a complementary fashion to the markets⁶, as can currently be seen in California for example.

Just as renewables, energy efficiency and all other factors that act to lower emissions also serve to reduce demand for EUAs, so would an EPS. If this leads to a lower carbon price, price incentives for CCS would be reduced. However, though this risk must be acknowledged, it is not insurmountable and should not preclude establishment of a mandatory EPS. As with other policies, adjustments to the market can allow them to work in harmony to encourage

⁵ Europe's failure to tackle coal <http://www.sandbag.org.uk/blog/2014/jul/23/Europes-failure-to-tackle-coal/>

⁶ Four energy policies can keep the 2°C climate goal alive
<http://www.iea.org/newsroomandevents/pressreleases/2013/june/name-38773-en.html>

reduced emissions. The establishment of an MSR will help to dampen the effects of faster emissions cuts from an EPS, as will adjustments to the ETS cap as the 2030 targets are imposed. Cancellation of the existing allowance surplus will set a precedent for future adjustment to the carbon market. An EPS merely ensures that an environmentally sensible MAC curve is followed: removing inefficient old coal first. With the ETS alone, even after reform, unabated coal may be allowed to continue as baseload out through the 2020s.

The necessity for a Decarbonisation Obligation or an EPS is further highlighted through the current and accelerating policy fragmentation across the EU such as the UK EPS. The EU needs to act now before a divided marketplace begins to appear across Europe, the anathema of the Union project.

In relation to CCS certificates and an upstream CCS obligation this can be made compatible with the ETS by ensuring that any allocation of CCS certificates to projects is either converted from or backed by an EUA allowance (that must travel with the CCS certificate) to avoid double counting. This form of policy could be focused on industrial CCS deployment and as such remain separate from an EPS or Decarbonisation Obligation applied to the electricity sector.

D6. When do you think EPS should become mandatory for new large combustion electricity generating plants?

As soon as possible

Comment

The roadmap to 2050 foresees CCS playing a growing role in the power sector from 2020 onward. For CCS to take up that load, incentivising the technology needs to begin immediately, and thus a Decarbonisation Obligation or EPS needs to be brought in as soon as possible. Owners of existing thermal power plant need to make investment decisions between now and 2020 based on regulations in the Industrial Emissions Directive. The full investment picture must account for properly priced or regulated greenhouse gases as well as non-GHG emissions.

The EU power market is currently oversupplied, in that there are significantly more power plants available than demand, and so a Decarbonisation Obligation or EPS at the right level can be applied immediately without fear of under capacity.

D 6.1. What could be a practical level of EPS (in gCO₂ / kWh)?

This depends on what level the EPS is set at (e.g. supplier, extractor, company, installation?), and would be expected to lower over time. A likely initial level for the EU could be 450g CO₂/kWh, as in the UK

Comment

Before deciding the CO₂ limit, a decision needs to be made about the level at which the limit should apply. Options include a maximum carbon intensity (gCO₂/kwh) limit for electricity generated with an annual carbon budget to allow running with a reduced load factor, or an absolute maximum CO₂ level applied to the stack. Alternatively a percentage target for the volume of zero carbon electricity generated can be set at Member State, emitting entity, power supplier level or some other level. (The USA EPA are opting for carbon intensity targets at state level). Yet another option is an obligation on the extractive industries to purchase downstream CCS certificates. Initial examples of EPS limits have only applied to new installations. However, 2015 will see Canada impose the rules on plants more than 50 years old. Thus another area of discussion is at what age an installation becomes regulated under an EU EPS.

After choosing where an Emissions Performance Standard applies, the limit could begin at a level that rules out unabated coal and high-carbon gas (for instance, from older inefficient plant) and then ratchet down towards 2050, further incentivising CCS and gradually ruling out all unabated fossil fuel power. In the UK and Canada, a maximum limit of 400-450 g/kWh has been chosen for new power stations on an annual budget basis which allows for high carbon plants to be run for short periods of the year for supply balancing. The European Investment Bank introduced a limit in 2013 of 550 gCO₂/kWh for new plants,⁷ despite the European Council's preference for a lower level, and this limit will be reassessed in light of the eventual 2030 package. A limit for electricity supplied could be set just below the EU 2013 average carbon intensity at 310g/kWh with adjustments for suppliers to reflect starting positions. Similarly if set at a Member State level the limits would need to be tailored to reflect different starting positions which vary widely throughout the Union.

A limit below ~400 g/kWh on emitting entities encourages CCS in that it would not be coal only; gas would be involved from the beginning, avoiding a situation where coal stations are simply closed and a short-term dash for gas begins without CCS development.

Sandbag sees any potential measure as a short-term way to force the MAC curve, with the majority of the following emissions cuts promoted flexibly by the EU ETS. As such, we would recommend a limit of ~450 g/kWh, allowing the most-efficient gas to continue unabated, but with a 10 year time horizon after which the EPS would be reviewed. (New gas would be expected to recover costs within 10 years.)

Member State level carbon intensity is currently poorly measured in the EU, allowing growth in low-carbon tech to mask continuing use of high-carbon generation. A clearer picture of each country's carbon intensity would facilitate calculation of an appropriate level for Member State Decarbonisation Obligations.

⁷ European Investment Bank emission limits for new plants
www.eib.org/attachments/consultations/elp_methodology_emission_performance_standard_20130722_en.pdf

Carbon Intensity of Power Sector, tonnes/MWh					
(Source, Sandbag, ENTSO-E, ETS data)					
	2010	2011	2012	2013	% Elec from coal, 2013
Poland	0.91	0.89	0.88	0.87	88%
Germany	0.49	0.50	0.50	0.51	48%
UK	0.48	0.45	0.51	0.47	43%
Denmark	0.51	0.45	0.41	0.44	42%
Netherlands	0.39	0.39	0.42	0.44	27%
Ireland	0.40	0.39	0.43	0.39	27%
Czech Republic	0.48	0.47	0.42	0.39	47%
Romania	0.43	0.49	0.48	0.36	30%
Hungary	0.36	0.34	0.34	0.34	24%
Italy	0.38	0.36	0.35	0.31	16%
Slovenia	0.33	0.33	0.34	0.31	32%
EU	0.33	0.33	0.33	0.31	28%
Malta	0.28	0.31	0.35	0.30	23%
Portugal	0.25	0.30	0.36	0.26	23%
Spain	0.22	0.28	0.28	0.22	15%
Belgium	0.20	0.18	0.18	0.17	3%
Finland	0.22	0.18	0.13	0.16	16%
Slovakia	0.14	0.14	0.13	0.11	10%
Austria	0.15	0.16	0.11	0.09	7%
France	0.05	0.04	0.05	0.04	4%
Norway	0.01	0.00	0.00	0.00	0%
Sweden	0.00	0.00	0.00	0.00	1%

Figure from Sandbag's July 2014 Report *Europe's Failure to tackle coal* <http://www.sandbag.org.uk/blog/2014/jul/23/Europes-failure-to-tackle-coal/>

Section E

E1. One of the original objectives of setting up the EU regulatory framework for CCS, was to ensure that this novel technology would be deployed in an environmentally safe way (Recital 9 of the CCS Directive). What is your view, on the following statements on whether geological storage of CO₂ leads to permanent containment of CO₂ in such a way as to prevent and reduce as far as possible negative effects on environment and human health, and any resulting risks for environmental and human safety?

CCS prospects have too rapidly centred on geological gas storage. There is great potential in mineralisation technologies which reduce leakage concerns and can produce useful aggregates. To broaden the scope of CCS technologies, certification is strongly encouraged in order that the many variations of carbon capture can be recognised and commercialised.

ENDS