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## SMART AND SUSTAINABLE GROWTH

# Carbon Capture and Storage: EU Advancing, but not Fast Enough

Stephen Tindale Associate Fellow, CER

Carbon capture and storage (CCS) is an essential low-carbon bridge technology, to be used in the several decades it will take before Europe can be totally reliant on renewable energy. The EU's energy commissioner Günther Oettinger recognises this<sup>1</sup>, and the EU has a programme to subsidise large-scale demonstrations by 2015. The money will come from auctioning permits under the Emissions Trading Scheme (ETS). CCS is not only essential to meet the EU's climate objectives; it is also a major business opportunity. So, it is welcome that the Commission is serious about promoting this technology.

However, the timetable for selecting projects and awarding grants makes the 2015 deadline look unlikely to be met. The amount of money available, being based on the ETS price per tonne of carbon, is uncertain. The portfolio of technology types and industrial sectors to be covered is not yet clear.

Beyond demonstration, rapid deployment will be necessary. This could best be achieved through regulation: limiting the amount of carbon emissions permitted per unit of production. Yet, the EU has made no progress on this. The Commission has at least recognized the need to think beyond demonstration and highlighted the need for carbon dioxide transport as a key part of the EU's future energy infrastructure<sup>2</sup>.

The greatest threat to CCS success in Europe appears to be strong public opposition to underground storage in several Member States, notably in the Netherlands and Germany.

1. For example: "Carbon capture and storage (CCS) stands out as one of the most important technological solutions if Europe is to achieve its goals for energy and climate change". Available at: [http://www.powergenworldwide.com/index/display/articledisplay/2121886504/articles/powergenworldwide/coal-generation/coal-generation-equipment/2011/01/ec-commissioner\\_backs.html](http://www.powergenworldwide.com/index/display/articledisplay/2121886504/articles/powergenworldwide/coal-generation/coal-generation-equipment/2011/01/ec-commissioner_backs.html)

2. European Commission, Communication, "Energy infrastructure priorities for 2020 and beyond – A Blueprint for an integrated European energy network", COM(2010) 677 final, 17 November 2010, available at: [http://ec.europa.eu/energy/infrastructure/strategy/2020\\_en.htm](http://ec.europa.eu/energy/infrastructure/strategy/2020_en.htm)

## New Entrant Reserve 300

The "New Entrant Reserve 300" (NER 300) fund was agreed in 2008 by EU heads of state to support CCS and innovative renewables technology. This is the revenue from the auctioning of 300 million ETS permits. At the time of agreement, the Commission spoke of this money being used to subsidise 12 large scale (more than 250 megawatt) demonstration plants, to be operational by 2015. But in November 2010, when it launched the competition for the grants, this was only for eight projects, using the revenue from 200 million permits. A second round of grants, for the other four projects, is promised for 2012, making it very unlikely that they will be operational by 2015.

The timetable for the first round could be speeded up. Potential projects had to apply to Member State governments by 9 February 2011. The governments had to assess them by early May 2011, and then pass on applications to the European Investment Bank (EIB). The EIB is expected to take around nine months before making recommendations to the Commission. Then comes the inevitable consultation / negotiation between the Commission and Member States. So, no actual awards are expected before the second half of 2012.

The amount of money available depends on the amount for which the permits are auctioned. At a price of 20€ per tonne of carbon, the revenue would be about €6 billion. But the current ETS price is significantly below this, reducing the revenue. The division between CCS and renewables has not been defined. And any EU money must be co-financed by the Member State government, and most governments are not flush with money at present. So, the CCS financial picture is very uncertain.

## Portfolio of technologies

The Commission has identified four eligible categories of CCS technology: pre-combustion, post-combustion, oxyfuel, and industrial applications other than the power sector. But it has yet to say how many of the demonstration projects will be in each category, arguing that all applications should be assessed without any pre-set portfolio for the awards. This is an understandable line to take in administrative and political terms (though there are legitimate questions being asked about the assessment criteria – discussed below). Still, there should be projects from each of the categories. Pre-combustion CCS covers the whole capacity, so it is good in emissions reduction terms. Yet, it cannot be retrofitted. Post-combustion can be retrofitted, but it does not necessarily cover the full capacity. It is necessary, as many existing power stations globally will have to be retrofitted to reduce carbon emissions far enough and fast enough. But, there is no justification for using public money to demonstrate post-combustion on new power stations. Oxyfuel technology covers the full capacity and

can also be retrofitted, but is a less developed technology than pre- or post-combustion, so it would be unwise to put all EU eggs in this basket.

Some money should go to demonstrate CCS on gas power stations. The Commission's grant awards to CCS projects under the European Economic Recovery Plan did contain one award to a gas power station in France, so it has a good track record on this. Nevertheless, the Commission should make it clear that the NER portfolio will also cover gas.

The portfolio must also include cement and steel. A recent report by the Öko-Institut, sponsored by the Greens / European Free Alliance, argues that around 7% of the emissions reductions needed to meet climate objectives by 2050 should be made through CCS the steel and cement sectors, plus biofuel processing.<sup>3</sup>

## Assessment criteria

The main criterion that the EIB and Commission are proposing to use is cost per tonne of carbon abated. Clearly cost-effectiveness is an important consideration, though the justification for publicly-supported demonstration projects is that CCS has yet to be demonstrated at large scale or integrated throughout the process, which means that costs are very uncertain estimates. Beyond this general point, a criterion of cost per tonne of carbon abated will inevitably favour coal power stations because coal is much more carbon-intensive than is gas. A better criterion, which would lead to a more balanced portfolio, would be cost per unit of low-carbon electricity produced. Scottish and Southern Energy (SSE), which wants to demonstrate CCS at a gas power station, is arguing for this:

Linking performance payments and / or assessment criteria to “£/tonne CO<sub>2</sub>” creates a perverse advantage for higher carbon power stations i.e. coal or inefficient power stations. This is a result of the higher concentration of CO<sub>2</sub> produced, the cheaper it is to collect on a £/tonne basis. A more appropriate measure would be ‘£/MWh of ultra-low CO<sub>2</sub> electricity’.<sup>4</sup>

## Which Member States are interested in CCS?

Major coal users Germany, Poland, the Netherlands, the United Kingdom (UK), and Spain, all have CCS projects awarded €180 million under the European Economic Recovery Plan (EERP), and are aiming to submit projects for the NER 300 grants. A number of countries that

3. Öko-Institut, “The Vision Scenario for the European Union, 2011 Update for the EU-27”, January 2011, available at: [http://www.greens-efa.eu/cms/topics/dokbin/368/368667.the\\_vision\\_scenario\\_for\\_the\\_european\\_uni@en.pdf](http://www.greens-efa.eu/cms/topics/dokbin/368/368667.the_vision_scenario_for_the_european_uni@en.pdf)

4. SSE response to UK Department of Energy and Climate Change consultation, “CCS Demonstration Competition Market Sounding Document”, 2010

did not get Economic Recovery grants are also aiming to get NER 300 grants, including the Czech Republic and Hungary. The notable absentee is Greece, which is very coal dependent (in 2008 52% of its electricity was generated from coal). The Greek government has strong opposition to CCS, on cost grounds.

## Deployment

Large scale demonstration projects are needed because CCS has only so far been shown to work at small scale and at various stages of the process, not at large scale or integrated throughout the process. But CCS will only contribute significantly to climate objectives if demonstration is followed – assuming it works as planned – by rapid and widespread deployment. So, how should deployment be achieved? There is the usual debate between supporters of market mechanisms and those favouring a regulatory approach.

The EU does not have a carbon tax, and is unlikely to get one any time soon, despite the Commission suggesting one as an “own resource” in the next Multiannual Financial Framework (2014-2020). Several Member States, including Germany and the UK, remain opposed to any EU taxes, on subsidiarity grounds. Jacques Delors spent much of his period as President of the European Commission arguing for an EU carbon / energy tax. But he failed to get the Member States to agree. Taxation measures require unanimity in the Council of Ministers, so any country can prevent adoption. In fact, many Member States, including the UK, opposed the Delors proposal on subsidiarity grounds – the argument that taxes are for national governments, not the EU. Other countries less opposed to EU integration, such as Germany, opposed the Delors proposals because they would have damaged their coal industries. After Delors’ failure on energy taxation, the EU moved to a ‘cap-and-trade’ system, the ETS. This is stronger than it was: the Commission has the lead role in deciding the total number of permits, and permits will be auctioned rather than given free to key sectors, including electricity generation. But the price of permits remains much too low. The ETS would only help significantly with CCS deployment if there was greater price stability and an expectation of prices rising substantially. Both could be achieved through a rising floor price.

The European Parliament tried to insert a regulatory limit on the amount of greenhouse gases emitted into the Industrial Emissions Directive in 2009. The Parliament was unsuccessful, but the Directive did at least acknowledge the right of Member States to set their own Emissions Performance Standard to limit the amount of carbon dioxide per unit of electricity (based on the Californian approach).

The UK government is taking a lead on these issues, currently consulting on setting a de facto ETS floor price by converting the Climate Change Levy (which, despite its name, is an energy tax rather than a carbon tax) into a carbon tax and making the power sector pay it (it

is excluded at present) and on setting an Emissions Performance Standard. The level of the standard has not yet been decided, but the options in the consultation paper would prevent any new coal power stations without CCS being constructed.

## Local opposition

A major worry for CCS supporters is strong and apparently increasing opposition from those who live near proposed storage sites and from some environmental Non-Governmental Organisations (NGOs). In November 2010, the Dutch government dropped Shell's proposal to store carbon dioxide from its oil refinery near Rotterdam in a depleted gas field under the nearby town of Barendrecht. This was despite the active support of the Rotterdam council and the Rotterdam Climate Initiative, headed by former Dutch Prime Minister Ruud Lubbers.

Many Barendrecht residents said they opposed the proposal because it could endanger the town. Some also said they feared a fall in house prices. Shell did try quite hard to win over local opinion, but critics say they only began trying this after protests had begun.

Vattenfall aims to capture carbon dioxide from its Schwarze Pumpe coal station in Brandenburg, Germany and store it under the town of Beeskow. But this project has also provoked considerable local opposition, with Beeskow residents erecting large yellow crosses along the route on which the carbon dioxide would be transported. They argue that the full impact of storing carbon dioxide below their town is not known and that they do not want to be used as "guinea pigs". Beeskow council vetoed Vattenfall's plans to conduct geological research and criticised the German federal government for allowing Vattenfall to proceed with its plans before introducing a federal law on CCS. Germany is required, under the EU carbon dioxide storage Directive, to have such a law by June 2011 but there have been repeated postponements – most recently in November 2010. The parties in the federal government, the Christian Democratic Union / Christian Social Union of Bavaria (CDU / CSU) and the Free Democratic Party (FDP), appear to be split on the issue. The two ministers with direct responsibility are Economy Minister Rainer Brüderle (FDP) and Environment Minister Norbert Röttgen (CDU) and so far they have been unable to agree.

There is strong opposition from some key Land governments, including Niedersachsen and Schleswig-Holstein, in which there are extensive potential storage areas. These governments aim to block any storage of carbon dioxide on their territory. They probably do not have the constitutional powers to do this but the federal government is said to be considering offering them the right to set a maximum limit, which might well be too low to allow any commercially viable projects.<sup>5</sup>

5. Frank Albrecht, "Nord-Allianz gegen Kohlendioxid-Lager", Schleswig-Holsteinischen Zeitungsverlags, 27 September 2010, available at: <http://www.shz.de/nachrichten/top-thema/article//nord-allianz-gegen-kohlendioxid-lager.html>

German environmental NGO BUND has claimed that there are "enormous risks" associated with CCS. There is little scientific evidence presented to back up this claim<sup>6</sup> and BUND is part of Friends of the Earth International, which supports CCS as a better bridge technology than nuclear. Nevertheless, a prominent and large environmental group speaking out against CCS has great potential for damage and delay.

## A business opportunity for Europe

As well as its contribution to climate control, CCS has the potential to be an excellent growth sector for the European economy. However, Europe is in danger of missing the bus. The Obama administration has given significant grants to several large CCS projects. China is constructing large demonstrations, largely with US financial support. Australia is doing likewise (though without US money).

As well as public opposition and the time it is taking to get awards made, another challenge for CCS in Europe is the predicted flat level of electricity demand for the next few years, following the recession. Many existing power stations will need to be closed in the next decade, partly for age reasons and partly to meet the Large Combustion Plants Directive. So there will need to be many new power stations, even if overall demand for electricity is flat. Nevertheless, major utilities, like E.ON, say that they are looking increasingly at expansion outside Europe.<sup>7</sup>

In order to take advantage of the business opportunity and make a major contribution to global climate protection, the EU must ramp up its efforts on CCS. Demonstration will require subsidy. Deployment may require continuing subsidy and will definitely require a combination of regulation and market mechanisms. The EU should therefore:

- speed up the timetable for the NER 300 grants with the aim of making awards by the end of 2011;
- set a floor price for the ETS, and pre-announce that the level will increase steadily;
- commit to no new coal power stations without CCS.

The next two Presidencies of the European Council of Ministers, Poland and Denmark, have significant interest in CCS. Poland gets around 90% of its electricity and heat from coal, and received a grant from the European economic recovery plan for a CCS demonstration plant. Denmark gets around half its electricity and a quarter of its heat from coal and when she was Danish Climate and Energy minister – before becoming Europe's Climate Action Commissioner

6. Jonas Helseth, "German CCS debate is misguided, Bellona says", The Bellona Foundation, 29 November 2010, available at: [http://www.bellona.org/news/news\\_2011/CCS\\_debate\\_in\\_Germany](http://www.bellona.org/news/news_2011/CCS_debate_in_Germany)

7. "Flat market prompts E.ON to look outside Europe, Power-Gen Worldwide", 25 January 2011, available at: [http://www.powergenworldwide.com/index/display/articledisplay/589265575/articles/powergenworldwide/Business/Policy/2011/01/flat-market\\_prompts.html](http://www.powergenworldwide.com/index/display/articledisplay/589265575/articles/powergenworldwide/Business/Policy/2011/01/flat-market_prompts.html)

– Connie Hedegaard said she was determined to ensure that one of the EU’s CCS demonstration plants should be in Denmark.

After Denmark comes Cyprus, which has no clear interest in CCS (its electricity comes from oil. CCS could and should be used at oil refineries and oil power stations, but the Cypriot government sees other issues as being more important). So in the second half of 2012, progress on CCS will be largely down to the Commission and Council President Herman van Rompuy.

Money for CCS will be hard to protect, given the economic circumstances and the high-level political arguments about the EU budget. The most sensible way to get more money available for CCS would be to stop giving public money to dirty coal. Member States should transfer all remaining subsidies to the coal sector to CCS programmes and the loan that the EIB has given Slovenia to build a new coal power station, without CCS, should be cancelled.