2016-IP33: New UK report from the Parliamentary Advisory Group on Carbon Capture and Storage

A report has been published to assess the potential contribution of CCS to cost-effective decarbonisation of the UK, with recommendations for government. The report was written by an advisory group made up of politicians and independent experts. I have extracted some of the report's key points for this Information Paper.

This report says that it addresses the policy disconnect that arose between the previous Government's cancellation of the CCS competition on grounds of cost and the advice it received from a number of independent policy bodies that CCS was an essential technology for least cost decarbonisation of the UK economy to meet international agreements (most recently Paris 2015). The Committee on Climate Change recently reported the additional costs of inaction on CCS for UK consumers to be £1-2bn per year in the 2020s, rising to £4-5bn per year in the 2040s. This report confirms that CCS is an essential component in delivering lowest cost decarbonisation across the whole UK economy, and that that heavy costs will be imposed on current and future UK consumers by a continued failure to enact an effective CCS policy.

The report points out that CCS has direct or indirect implications for the decarbonisation of all four of the major fossil fuel consuming sectors of the UK economy – industry, power, transport and heating. They need to be considered together so that synergies of a common infrastructure can be exploited. Other routes to decarbonisation are possible but in some important sectors they would be more expensive than using CCS.

There is a widespread view that CCS has to be expensive. The report emphasises that on the contrary, the high costs revealed by the earlier UK approaches reflected the design of these competitions, rather than the underlying costs of CCS itself. This poor design led to the lack of true competition and the imposition of risks on the private sector that it cannot take at reasonable cost for early full-chain projects. Previous third party analysis by the CCS Cost Reduction Taskforce and for the Committee on Climate Change as well as analysis performed for this report show full-chain CCS costs at c.£85/MWh under the right circumstances. This report concludes that, under the right conditions as set out in this report, even the first CCS projects can compete on price with other forms of clean electricity.

On storage, the report says that the lowest cost CO_2 storage solution for the UK at the scale required will be offshore geological storage in UK territorial waters, and that the state will need to take an enhanced role in managing storage risk if costs are to be minimised.

The first of the main recommendations the report makes is that to ensure a CCS Delivery Company ("CCSDC") should be established that will initially be government owned but could subsequently be privatised **(Recommendation 1**). This company will have the responsibility of managing "full-chain" risk and will be responsible for the progressive development of infrastructure focused on industrial hubs to which power stations and other emitters could deliver CO_2 which, for a fee, will be pumped to appropriate storage.

The UK CCS industry should operate under a regulated return style of economic framework. This provides for the lowest cost of capital and hence lowest cost to the consumer and creates the highest prospect of mobilising private capital at the earliest opportunity. This regulatory framework should be put in place now, drawing to the greatest extent possible on existing and trusted frameworks in the UK energy sector **(Recommendation 2)**.

The infrastructure developed by the CCSDC will facilitate CCS for other sectors such as industrial processes that cannot support its development on their own. CCS in industry represents some of the cheapest available carbon abatement in the UK economy. However, UK industry does not have the

incentive, scale or financial capacity to support the development of CCS infrastructure. A payment scheme will therefore be needed to give industrial emitters an incentive to collect their CO_2. Such "Industrial Capture Contracts" will need to be funded directly by HMG **(Recommendation 3).**

The report highlights that heat may be the most important sector for CCS in the long-term. The options for decarbonising the private gas heating boilers, that contribute a large part of the heating demand as well as the rest of the heating sector, are limited. One possibility is to replace gas boilers by decarbonised electrical heating. In this case, even with widespread use of heat pumps, the maximum demand for grid power in winter would become several times what it is today. There would need to be new generating capacity (nuclear, CCS or renewable), additional on-grid electricity storage and a significant strengthening of the grid to carry the heavy load of the seasonal peak. Another option is to repurpose the recently renovated natural gas distribution network and use it to supply hydrogen to domestic heating and cooking appliances and industrial users. A switch to hydrogen has the advantage that the seasonal peak heat demand can be met by hydrogen which has been stored through the year and hence without further material change to the distribution network. At the moment this is only an option, but the case is sufficiently compelling and the timing sufficiently critical that the government should build on the excellent recent work in this area and initiate further preparatory work without delay through the formation of a "Heat Transformation Group" **(Recommendation 4).**

Decarbonised hydrogen can be produced by electrolysis of water and could open the way to a future fossil fuel free economy but for the immediate future would be produced from hydrocarbons with CCS. A hydrogen network could also be used for clean power generation and for emission free vehicles (particularly in heavy goods transport).

The report recommends CCS Certificates and a CCS Obligation provide the long-term assurance and incentive framework for the private sector, with a two stage development of the CCS industry. In the first phase involving substantial state sponsorship, the CCSDC delivers both power projects and backbone transport and storage infrastructure at industrial hubs around the UK. This then de-risks the investments for additional capture and transport and storage investments in the second phase. This creates the opportunity to implement an assurance and incentive scheme for an industry operated by the private sector and funded by private capital which has a clear pathway to meeting the UK's decarbonisation goals for the middle of this century. A CCS Certification System should be implemented immediately to verify that particular volumes of CO_2 have been securely stored by any valid means including forms of re-use **(Recommendation 5).**

A market-style incentive system in the form of a CCS Obligation on all fossil fuel suppliers to store a growing percentage of the emissions resulting from that fuel could be introduced in the late 2020s **(Recommendation 6**). This can guarantee a continued demand for CCS to underpin investor confidence and align demand to achieving the UK's national and international commitments to decarbonisation.

The report states that the government should act now, there is no reason for delay. CCS has the potential to be safely storing 15% of current UK CO_2 emissions by 2030 and up to 40% by 2050. The development of CCS hubs would provide jobs and economic stimulus in parts of the country where they are most needed. CCS will be required under any choice of options for the UK and the cost to the consumer will be minimised if the infrastructure is developed progressively as part of the long-term strategy set out in the report.

From an IEAGHG perspective, it is desirable to have evidence-based policy-making, and this report brings together evidence on the need for CCS and it provides policy recommendations on how to deliver CCS projects in a country such as the UK. We note the emphasis on CCS supporting power

generation from gas, an area previously covered by IEAGHG (see IEAGHG Report 2012-08). Other interesting aspects include the application for CCS in heat provision via hydrogen supply. IEAGHG is looking at this topic and will be publishing a report soon on CO_2 capture in hydrogen production, and we recently published an Information Paper on the Leeds City Hydrogen study (IP 2016-IP22). Also relevant to three of this report's recommendations, IEAGHG is looking at infrastructure development issues, such as international examples of actual and potential hubs and clusters (IEAGHG Report 2015-03) and a new project on cluster commercial deployment which is just underway.

In terms of technology R&D, the report notes that both the CCS projects in the cancelled competition were content to proceed using current technology for the capture of CO_2, its transportation and its storage. Given the timescale for decarbonising the UK economy, it states that there is not enough time for more than incremental improvements in capture technology at power stations.

The report appears to have received positive media attention in the UK national newspapers and radio. The most important attention it gets will be that of the UK government, and its response to the report.

The full report is "Oxburgh (2016): LOWEST COST DECARBONISATION FOR THE UK: THE CRITICAL ROLE OF CCS. Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage (CCS)", and is available at the link http://www.ccsassociation.org/news-and-events/reports-and-publications/parliamentary-advisory-group-on-ccs-report/

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