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Demonstrating Carbon Capture and Geological Storage (CCS) in emerging developing countries:

financing the EU-China Near Zero Emissions Coal Plant project

SUMMARY OF THE IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

1. PROBLEM DEFINITION: WHAT IS PRECISELY THE PROBLEM, WHO IS MOST AFFECTED AND WHY IS PUBLIC INTERVENTION NECESSARY?

Both developed and developing countries need to act to reduce their greenhouse gas emissions, to achieve the objective of limiting average global temperature increase to less than 2°C compared to pre-industrial levels. European Commission analysis indicates that under an emissions scenario compatible with the 2ºC target, around 18% of global fossil fuel power generation would have to be fitted with CCS in 2030.

As part of a range of low carbon technologies, CCS deployment in fossil-fuel dependent emerging and developing countries could play a vital role in helping achieve global sustainable development. However, in a business-as-usual scenario (ie without additional assistance from the public sector and without international agreement or national policies establishing a carbon market price), CCS would not be demonstrated at commercial scale outside of OECD countries and would therefore not be viable for large scale global deployment on a timescale commensurate with the need to reduce global emissions by at least 50% by 2050. Without global development, demonstration, diffusion and deployment of CCS, the fight against climate change could be significantly more expensive.

The different components of the CCS process are already operational, but one challenge is in combining all these elements to enable the commercial deployment of CCS in the power sector. There are many barriers to the demonstration and subsequent deployment and diffusion of CCS technologies in developing countries. The provision of public funding can help overcome some of these barriers and lever private financing which would not otherwise be available. Demonstration can promote a better understanding of the technical, methodological, political, legal, environmental, public acceptance and financial issues and therefore facilitate a better estimation of the extent to which we could rely on CCS as one of the key future mitigation technologies. A positive demonstration experience will reduce perceived risk; facilitate further demonstration on the path to deployment and diffusion, and help drive down costs.

2. ANALYSIS OF SUBSIDIARITY: IS EU ACTION JUSTIFIED ON GROUNDS OF SUBSIDIARITY (NECESSITY AND EU VALUE ADDED)?

Because of the scale of the problem and the costs involved, action by individual MS is unlikely to have any impact. In 2005, the EU and China committed to develop and demonstrate in China and the EU advanced, near-zero emissions coal technology through carbon capture and storage. The development and deployment of CCS in China and other emerging economies would be significantly delayed without assistance from developed countries. The EU's commitment, coupled with technological and financial assistance is a unique offer which can help to maximise the potential for CCS in emerging economies.

Because of European leadership in climate change policies and technologies and the massive potential for abatement in China due to the rate of expansion of its coal-fired power plant fleet,

Europe and China have a unique opportunity to work together to develop and demonstrate CCS technologies for future deployment. These are among the aims of the EU-China Climate Change Partnership, established in 2005.

China adopted a National Climate Change Programme (CNCCP) in June 2007, which specifically mentions the development of technologies for CCS. Specific CCS technology guidelines are planned for publication in 2009.

3. OBJECTIVES OF THE EU INITIATIVE: WHAT ARE THE MAIN POLICY OBJECTIVES?

The EU's general policy objective is:

- To limit the increase in global mean surface temperature to be 2°C compared with pre-industrial levels, which in turn requires that global greenhouse gas (GHG) emissions peak by 2020 at the latest and be reduced by at least 50 % as compared with 1990 levels by 2050 and continue to decline thereafter.

The specific objective of this policy in contributing to this is:

- To facilitate early deployment of CCS technology in emerging developing countries in order to maximise the public benefits of these technologies (GHG emissions reductions, improved air quality), as they move from demonstration to deployment, and to increase experience and economies of scale and drive down costs, initially using China as a case study.

Operational objectives are to:

- Identify the additional financing needed for a large scale CCS demonstration plant in China in the absence of a global carbon price or other incentive, in order to enable demonstration quicker than might otherwise be the case under normal market conditions.

- Provide financing through a viable financing model for CCS demonstration in China, which brings together public and private financing as a concrete example of technology and financing cooperation between developed and developing countries in the context of the international climate change negotiations.

- Given limited resources from the Community budget, **determine a split of public/private financing** to maximise the leverage of the public funding, to be explored further in the design of the above-mentioned vehicle.

4. POLICY OPTIONS: WHICH OPTIONS HAVE BEEN CONSIDERED AND WHICH HAVE BEEN ASSESSED IN DETAIL?

Options considered for financing CCS demonstration in emerging economies were a) no involvement, b) relying on public grant funding and c) setting up public-private partnership. For a public-private partnership, three models were considered: joint undertaking, ITER-type ad-hoc international treaty and special purpose vehicle (SPV).

5. ASSESSMENT OF IMPACTS: WHAT ARE THE MAIN ECONOMIC, ENVIRONMENTAL AND SOCIAL IMPACTS?

In order to assess the amount of investment required and the public/private financing necessary to ensure an appropriate return for private investors, existing literature and estimations of the cost of a commercial-scale CCS demonstration plant were reviewed (bearing in mind that globally, none has been built yet) and used as the basis for specific calculations. The additional capital and operational cost over a lifetime of 25 years for this first-of-a- kind 400 MW demonstration plant[1] is estimated at around €730 million for an IGCC plant (€125m for capital cost and €340m for operational costs, €265m for transport and storage costs[2], approximately) and around €980 million for a pulverised coal plant (€235m for capital cost and €445m for operational costs, €300 for transport and storage costs[3], approximately). Within this period a strengthening of the global carbon market and the emergence of a domestic carbon price in all major economies can be expected. Assuming a carbon value of €10/tCO_2 in 2015 gradually increasing to €20, the financing gap is estimated at roughly €300 million for an IGCC plant and at €550 for a pulverised coal plant. Sensitivity analysis showed that the cost estimate may vary in the range of +/- 40% according to the specific technology and construction/storage sites chosen.

It is not possible in the course of this Impact Assessment to assess the full range of impacts of CCS *deployment* in China, and that is not our immediate policy objective. Rather, we attempt to assess the impacts, particularly the financial impacts, of using a combination of public and private financing to support our policy objectives and extrapolate broader impacts where possible. This analysis focuses on one demonstration project, which in itself is not likely to lead to a major immediate reduction of emissions or to immediate economic benefits. Also, the direct social and employment impacts are likely to be very limited due to the limited scale of the CCS demonstration projects.

In generic terms and at large scale, environmental impacts of CCS relate to improved local air quality and global atmospheric concentrations of greenhouse gases with resultant health and economic benefits from reduced exposure to air pollution and reduced climate change impacts. Physical problems of potential CO_2 leakage can be avoided by the employment of appropriate site selection, modelling and monitoring techniques.

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1 Expressed as net present value in 2010 over the 4 years of construction and 25 years of operation using a social discount rate of 2.5% (net of inflation).

2 This includes capital and operational costs over 25 years of 7€/t CO_2 stored.

3 This includes capital and operational costs over 25 years of 7€/t CO_2 stored.

The key impacts of China being in a possible first wave of CCS demonstration globally relate to the learning benefits and first-mover advantages in relation to achieving future emissions reductions and avoiding carbon lock-in.

The CCS demonstration project and the supporting financial vehicle are designed under the assumption that carbon will have a value in China and other emerging and developing countries in future that will take into account the social price of carbon.

6. COMPARISON OF OPTIONS: WHAT IS THE PREFERRED OPTION ON THE BASIS OF WHICH CRITERIA/JUSTIFICATION?

In order to bring together the required sum of funding and minimise the strain on the public budget, a public-private partnership was identified as the most suitable option for financing a CCS demonstration project in China Three public-private partnership models were analysed: a Special Purpose Vehicle (SPV), a Joint Undertaking under Art. 171 of the EC Treaty, and the "Ad hoc international treaty" model used to establish the ITER collaboration on the design and construction of an experimental fusion reactor. The SPV (or a similar investment vehicle) was identified as the most suitable model. Potential future revenues from the carbon market would be an incentive for the private sector to invest in the SPV.

7. MONITORING AND EVALUATION: WHAT ARE THE ARRANGEMENTS TO ESTABLISH THE ACTUAL COSTS AND BENEFITS IN THE ACHIEVEMENT OF THE DESIRED EFFECTS?

The performance of the SPV would be subject to monitoring; risk management and compliance procedures ensure compliance with appropriate laws and guidelines. The SPV would be set up with a governance structure to ensure that the appropriate body (e.g. an Investment Committee or a Board of Directors) would supervise the monitoring and control of the correct implementation of the investment and divestment decisions.

The Community Budget contribution to the investment vehicle would come from the Environment and Natural resources Thematic Programme (ENRTP). Cooperation with China on CCS under the auspices of the ENRTP would be monitored in compliance with the standard provisions under the development cooperation funding instrument.