Expert Group Meeting on Carbon Capture and Storage and Sustainable Development

Concluding discussion and summary of remarks

Combating climate change requires a long-term shift to a low-carbon economy powered by a range of clean energy technologies. However, in view of the current levels of use of fossil fuels, it is expected that energy systems will continue to be mainly dependent on use of these fuels for the foreseeable future. At the same time, the role of energy efficiency and other energy sources, such as wind and solar, will be of increasing importance. Carbon capture and storage (CCS) is important because it provides the means of dealing with the CO_2 emissions resulting from use of fossil fuels while preparing to make the transition to an energy system with intrinsically lower emissions.

The following are some key points that emerged in the course of the meeting and in particular the concluding session.

Context and global issues

- It was mentioned that recent political statements (e.g. the G-8 Heiligendamm meeting) recognize the need for reduction in global emissions in the region of 50 per cent by 2050 by developed countries and express the hope that major emerging economies would join in this activity. This is a strong reason for use of measures which can make deep reductions in emissions from individual facilities (e.g. >80% cut in specific emissions) and which can be widely deployed to make substantial contributions to cutting national emissions. Such measures include CCS used in centralised facilities such as power generation, and also in natural gas processing, manufacture of cement and iron and conversion of coal or gas to liquid fuels.

- The view was expressed that the question of sustainable development in relation to CCS needs further attention, which should be addressed before focussing on means to accelerate deployment. The issue was also raised of whether there were suitable bodies and institutions to address the sustainability of CCS. However, in response, it was noted that given continuing global reliance on fossil fuels, tackling emissions (rather than substitution by renewable energy sources, which was happening only slowly) might be considered the most fruitful way of improving the sustainability of the energy system.

- From a policy perspective, CCS has the advantage that relatively few decision makers would need to be engaged in deciding to take action. If relevant installations can covered, it would be a quicker way of reducing emissions than trying to influence millions of consumers, for example, to improve domestic energy efficiency.

Technology

- **Picking winners**: It is appropriate for governments to set emission reduction goals and establish frameworks for action, but governments should not make choices between different technologies, e.g. IGCC or PC. Technology choice should be left to the relevant commercial concerns and industries, which are better

placed to evaluate the implications and also tend to be more successful innovators than governments.

- **Fast-tracking the technology cycle:** The development of the technology, its scale-up and transfer to users in other countries are all important aspects of the sustainability of a technology. The "usual" linear route of research, development followed by deployment does not apply in this case - it would be too slow to tackle the climate dangers facing the world, nor is it cost-effective.

- **Demonstration and system integration**: There is a need for proof of concept demonstrations with real-life CCS plants with storage onshore. It is vital to demonstrate whole systems to build confidence with the utilities. This is a very specific need on a path to establishing a new technology in the marketplace. Also it is important to find out how to remove the barriers to the "low-hanging fruit" (e.g. storing CO_2 from natural gas processing) to advance the technology. In particular these could be important as large-scale sources of CO_2 capable of supplying a number of large storage demonstrations which could be monitored in order to address the issue of confidence in the security of storage.

- **Retrofitting**: It was noted that there are existing fleets of coal-fired power plants of various vintages in many countries, and the utilities will want to keep these running as long as possible. It would not make economic or technical sense to retrofit old and inefficient plants with CCS. Their already low efficiency would be seriously eroded, so that the overall cost-effectiveness of the modification would be very poor.

- New plants may be constructed in the next few years which are not fitted with CO_2 capture so it is important, at the very least, that nothing is done to impede the future fitting of CO_2 capture - for example they should be designed so as to leave sufficient space around the plant. However, retrofitting capture will always be more costly overall than building a plant with capture in the first place so industry should be encouraged to adopt CCS as soon as possible. Several major utilities in Europe and North America are already planning to build one or more plants each, if appropriate regulatory and financial frameworks are put in place.

<u>Storage, monitoring and infrastructure</u>

- **Storage:** It was noted that storage of CO_2 is the area which probably raises most questions, and could be a source of concern to the public if they are not well informed about it. Risk of release is greatest during the injection phase and declines over time once injection has ended.

- The integrity of the storage site has both technical and institutional aspects which need to be addressed. For instance, whether CO_2 was classified as "hazardous waste" could have major impact on permitting and project viability.

- At present, no international standards for capacity estimation have been established, although progress has been made at the national level in several countries. Generally speaking capacity, as such, was not considered the key issue but rather how the sources would be linked with the storage sites (e.g. point-to-point pipelines or networks).

- **Monitoring and verification**: There was general agreement that procedures in this regard needed to be elaborated, especially for storage sites. It was noted that technologies such as seismic imaging could be applied very successfully for monitoring the underground. Technologies were also available for monitoring at the surface but siting such systems to detect possible releases presented a challenge.

- It was noted that, although it might be too early to regulate CCS internationally, the CDM Executive Board's involvement with the questions of CCS under the CDM could have the effect of promoting the development of international standards on the management of storage sites and CCS systems. These are areas in which other organizations, such as the ISO, could consider instituting work.

- The discussion touched on the notion of "country-readiness" and what this could mean in practical terms. This could apply to developing countries that, while not planning near-term CCS deployment, were assessing the potential and technical requirements of using CCS. International assistance and cooperation will be important in this regard.

- **Infrastructure**: The extensive pipeline network for transporting CO_2 for enhanced oil recovery (EOR) in USA provides experience and demonstrates feasibility. As the number of applications of CCS increases, there will be a need for dedicated infrastructure with all the consequences for investment, public attitudes, etc. which are evident in other infrastructure investments. However, without this, some projects will find it overly expensive to install pipelines with adequate capacity for future expansion.

<u>Costs and finance</u>

- Finance was highlighted as a key issue. In the future, stricter limits on GHG emissions would make CCS more competitive. In many jurisdictions, for instance at the state level in the U.S., viability of pilot CCS plants depended, in part, on regulatory decisions permitting cost recovery. Another issue raised was how to bring in more commercial sources of finance. Over time, economies of scale and learning by doing would bring down costs.

- Developing countries' efforts to advance economic and social development are accompanied by increasing energy use. Given the cost of CCS, developing countries will require special instruments for facilitating access to technologies such as CCS. In this regard, the potential role of the Global Environment Facility (GEF) in supporting CCS was raised. Strengthening and deepening existing technology cooperation partnerships and arrangements relating to CCS was also underlined as important for the future. The policy relating to CCS projects under the CDM is still evolving. It was noted that many developing countries tended to prefer to use smaller-scale and lower cost measures, of which there are many, even though these would not make such deep reductions in emissions as CCS. Nevertheless, there are particular applications of CCS, such as storing the CO_2 separated from natural gas processing, which could make significant reductions in

emissions without substantial cost (as for example is being done in Algeria at In Salah).

Conclusions

- There was general agreement that CCS could play a useful role in tackling greenhouse gas emissions. It was also thought that there is a need for international cooperation on issues such as sustainability and standards, to promote sharing of best practice and to provide access to expertise wherever it is needed.