



The Royal Academy
of Engineering

Carbon Capture and Storage

Response from The Royal Academy of Engineering to the Environmental Audit
Committee

June 2008

1. The UK, along with the rest of the world, is facing an increasingly difficult challenge to maintain an affordable and secure energy supply while at the same time reducing its emissions of carbon dioxide in an effort to mitigate against the effects of global warming. Over the coming decade approximately 20GW of electrical generating capacity will be lost owing to the closure of aging nuclear power plants and inefficient coal fired boilers. If the lights are to stay on, these will need to be replaced quickly. A new generation of nuclear plants is becoming more of a possibility and renewable energy, primarily in the form of wind farms, is supplying an increasing amount of our electricity but both these options require time. The question remains as to whether coal has a role to play in the UK's future energy system.
2. In global terms, despite the current drive for renewable energy, fossil fuels are still expected to account for the bulk of the world's energy supplies for the foreseeable future. The International Energy Agency, for example, predict that in 2030 over three quarters of the world's primary energy supplies will come from fossil fuels with over a quarter from coal alone. Also, known coal reserves outstrip those of any other conventional fuel and large amounts of this coal are found in rapidly developing countries such as China. Therefore, It is clear that coal has a significant role to play in global energy markets for some time to come.
3. This might not represent a problem were it not for the fact that coal fired power plants emit more carbon dioxide per unit of electricity than any other type of generator. With concentrations of CO₂ in the atmosphere higher than at any time over the past half a million years and rising faster than ever, burning the world's remaining coal reserves and emitting the resultant CO₂ into the atmosphere will contribute significantly to dangerous rises in temperature and all the associated risks for both human society and the natural environment.
4. While it may be possible to reduce the UK's dependence on coal, it is unlikely that the rest of the world will follow suit. It would seem, therefore, that the only viable alternative is to develop and deploy carbon capture and storage (CCS) technologies as quickly as possible and establish a leadership position for the UK in this technology.
5. The various technologies associated with CCS are at different stages of development (some are proven at small scale and some are very new concepts) but progress is being made across the whole field. A number of alternative means of capturing the CO₂ are being developed, both pre- and post-combustion, and the geological storage of the CO₂ has also been trialled, although thus far it has predominantly been in enhanced oil recovery projects. What is lacking so far is a full scale commercial pilot project which will prove the overall viability of CCS. Support for such a demonstration plant is urgently needed if progress is to continue and in reality, given the complexity of the task, more than one will be required.
6. The Government's recent announcement of a competition to help fund a CCS demonstration plant in the UK is welcomed. Clearly, one of the main barriers to industry will be the high financial costs associated with developing the necessary processes and technologies and it is right that the Government should bear some of the financial risks in order to promote a technology which is in both the national and international interest. However, as has already been mentioned, implementing CCS on a wide-spread commercial scale is an enormously complex task and the competition should not be seen as the only support mechanism. For example, specifying only post-combustion capture in the

competition neglects the various pre-combustion methods that could also have a role to play, but it does recognise that if rapid uptake of a CCS technology is to be stimulated in the developing world post-combustion is the most likely candidate.

7. If CCS is to have any impact on CO₂ emissions then ultimately many millions of tons will need to be safely transported and stored. This could lead to an industry on the scale of the current oil and gas industries and a massive investment in research and infrastructure. A great deal of work is needed to assess suitable geological storage sites that will be capable of safely storing the CO₂ for the required time spans and these sites need to be matched to appropriate locations for the power plants. Closely linked with this will be the legal and regulatory frameworks that will deal with health & safety, international agreements, standards and environmental impacts. Much work is already being carried out in this field and the UK Government must continue to be fully engaged in the process. In addition, a great deal of primary research is still required and the Government must continue to support this through the research councils, the Technology Strategy Board and the Energy Technologies Institute. Ultimately, UK plc should benefit from such investment by staying at the forefront of a burgeoning global CCS industry, although it is also vitally important for the UK to stay fully engaged with international initiatives such as the EU Framework programmes.
8. Given a sufficient level of support there is good reason to assume that CCS will provide a means to continue using coal to provide electrical power in the future. The engineering practicalities of its wide-spread implementation are by no means trivial and should not be underestimated but there is reasonable optimism that engineers and scientists will overcome these difficulties. Unfortunately, the one commodity which is in the shortest supply is time. Even the most optimistic proponent of CCS would not envisage any demonstration plant to be operational much before 2015, which would put wide-scale deployment as far away as 2020 or later after lessons from the pilot have been learned and digested. In the meantime, coal fired power plants are being built all around the globe and these will be in operation for many decades. If these plants are not built to be capture ready, then much of the work currently being carried out will be in vain. It is therefore crucial that any new coal fired power plants are built with the capacity to be retro-fitted with capture technology.
9. The Government was clearly aware of this fact when it limited its competition to post-combustion capture technologies and it would seem highly counter intuitive to consider coal fired plant to be built in the UK which was not capture ready. Not only would this be inconsistent with the UK's future energy policy but it would also send out the wrong signal to the rest of the world where the UK is looking to take a lead on climate change. This is an issue which is very pertinent at present in the case of Kingsnorth. The fact that Kingsnorth has entered the Government's competition is welcome news but in the event of it not being successful, every effort should be made to ensure that it is built with capture ready capabilities. In reality, despite some debate over the precise definition of what capture ready entails, ultimately all that is required to fulfil this condition is to provide additional land and satisfy a minimum of technical specifications and hence should not represent any onerous costs. Indeed, if a power station in the UK cannot be expected to meet such a condition then it is difficult to see how we could place similar demands on power stations in China. Conversely, if capture ready becomes the norm in western economies then it is likely that China will follow suit.

10. In summary, The Royal Academy of Engineering supports the development of CCS and has actively followed the issues in conjunction with other bodies such as the Royal Society and the IEA Coal Industry Advisory Board. We have a number of Fellows who are at the forefront of research in the field both in industry and academia. The Academy is keen to offer the Committee any assistance in their consultation but at this stage we would stress the urgency of bringing this technology on-line as quickly as possible as the window of opportunity is fast running out.

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