

Alternative options

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A future for fossil fuels

Carbon capture offers a way to keep burning fossil fuels while meeting strict emissions targets, says Stuart Haszeldine

Public awareness of carbon dioxide capture and storage (CCS) hovers around two percent of the adult population. Yet many key players in the fossil fuel energy industries – the Treasury, DTI and Defra – are taking a very close interest. Why is there such a disparity?

All serious predictions indicate that during the next 20 years the UK, and the world, will be using more fossil fuel than in the last 20. This will produce carbon dioxide – and the UK is on course to miss its reduction targets in 2010 by 34 million tons per year. The rise of renewables is more than welcome, but still too gradual for fundamental change. The cost of new-build private nuclear – and not least the spectre of radioactive waste disposal in the long term – makes that a difficult proposition.

What if there was a third way forward? A way which could help the transition to a new energy, low carbon economy, whilst keeping the lights on and enabling high-technology employment in the process?

Capturing carbon dioxide emissions, from point sources such as power stations, and then storing the liquefied gas deep below ground, is a concept whose time has come of age. Now, with recognition growing that climate change will have serious effects on all our lives, there is a need to limit the increase of carbon dioxide in the atmosphere, and to reduce the total amount emitted by burning coal, oil, and gas, and by making ammonia, paper, iron and steel.

An even more important effect is that carbon dioxide from the atmosphere inevitably ends up in the ocean. Simple secondary-school chemistry shows that this makes the ocean more acid. More acid changes the ability of sea creatures to live in the ocean, or in the sediment of the sea bed. The results of such changes in shallow seas, like the North Sea, are deaths of species. Where such changes have occurred in the geological past, entire oceans have died.

The UK has a world-class opportunity to use CCS. From hydrocarbon exploration we have unrivalled knowledge of our offshore geology. These are some of the world's best-known and most accessible sediment basins, and contain both depleted oil and gas fields and deep aquifers of saline water. The pores in such sediments can hold at least 70 years' production of carbon dioxide produced by all European power stations – some estimates state 500 years. Natural carbon dioxide occurrences offshore show that safe storage can be measured in millions of years – not just the 10,000 years required to mitigate climate or ocean acidification.

The most promising initial developments may exploit 'enhanced oil recovery' which can inject carbon dioxide to produce 10 per cent more oil from existing fields. An extra 900 to 2,000 million barrels of UK oil production can also store 700 million tons of carbon dioxide. A group led by BP and Scottish and Southern Energy has plans to convert natural gas into hydrogen and carbon dioxide at Peterhead power station, then pump the liquefied carbon dioxide to deep storage offshore in the Miller oilfield, and burn the hydrogen to raise steam-powered electricity with near-to-zero carbon emissions. This will be a world first, if running costs can be met for the 10 to 20 year timescale.

CCS has many advantages. It permits the UK to use fossil fuels with clean

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emissions, and to produce hydrogen when required. That means security of supply using coal and some gas. Generation of electricity from fossil fuels provides an ideal compliment to a base-load generation from intermittent renewables, as fossil power can be ramped up or down daily, or monthly. CCS uses existing technologies, manufactured by established industries. The engineering uses UK skills in offshore engineering, project management, pumps, boilers and turbines. It is essentially a new high-technology industry worth billions of pounds per year. Any of these technologies have huge export or licensing potential to power-hungry China and India or South Africa, Mexico and Brazil.

This possibility has not been ignored by the USA, where 35 per cent of CCS investment is expected to return from exports.

Barriers to CCS are considered to be financial, so that industries and the EU both aim to reduce carbon dioxide capture costs to £20-£30 per ton before 2010. Storage costs of £10-£20 per ton may be offset by emission trading scheme purchase of permits. In the UK there is an urgent need for a government lead on issues such as long-term ownership of carbon dioxide, the legal permitting regime for storage sites, and the financial regime for reduced tax on extra oil produced, or clean power incentives similar to 'conventional' renewables. And simultaneously, we need to inform, educate, and engage the great British public.

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