

UK Tony Lodge reports on a new clean coal concept using pulverised fly ash

The term clean coal has come to mean many different things to different people and organisations. In some respects, it has come to mean everything and nothing, a vague sound bite used by many who do not understand or appreciate the concept of using the world's most abundant fossil fuel more cleanly, efficiently and responsibly.

For those involved in the coal sector, whether it be from a mining, engineering or electricity supply perspective, the clean coal solution and the potential behind it is very real. To some it has come to mean the combustion of coal and the ability to limit its carbon impact through either pre- or post-combustion technology with CCS. To others, clean coal also includes high efficiency supercritical technology, coal gasification, modern flue gas desulphurisation (FGD) technology and coal treatment, such as drying of high moisture coals to boost thermal efficiency and limit emissions. In short, it covers many areas and is not exclusive to any one technology or concept. Today, an important and potentially ground breaking new concept in the clean coal solution can be revealed.

Using byproducts

The clean coal solution banner has never been effectively hoisted over the physical byproduct of coal-fired power generation: pulverised fly ash (PFA). The world produces hundreds of millions of tonnes of PFA and most of it is dumped in landfill sites alongside power plants. For the first time, a credible case can be made to include PFA as part of the modern clean coal solution, and the coal generation sector should quickly move to support it.

Lichen Renewal, a British company, has pioneered a new concept that allows the use of abandoned PFA in the capture and use of methane from gassing landfill sites across the UK. It has billed this process as a genuine green role for coal's waste. The PFA – ideal as a tight and low permeable barrier – is used to cap these gassing sites and channel the gas for extraction and further use. There are 22,000 historic landfill sites in the UK, of which 1500 are considered significant in terms of methane

emissions to the atmosphere. These sites were used to dump biodegradable household and general garden waste between the 1960s and early 1990s. They were not engineered to contain the resulting landfill gas and polluting leachate.

These historic sites are effectively unregulated: they do not have an Environmental Permit and are therefore not included in the official figure. The emissions from these historic sites have therefore been termed "orphan carbon."

Landfill gas is consequently released into the atmosphere, whereas Lichen's technological approach can allow it to be captured and used to generate energy. Landfill gas is typically made up of 60% CO₂ and 40% methane. However, methane is a 25 times more powerful greenhouse gas than CO₂. Using coal's waste can thereby create green energy.

A deliverable solution

Britain's elderly but vital 16 coal-fired power plants represent 29 GW of the UK's installed capacity, or 34% of the total. In recent winter months, these coal-fired plants increased production to account for up to 47% of the country's electricity. Britain will continue to rely on these plants for many years, with some expected to install selective catalytic reduction (SCR) technology to secure life extensions towards the end of this decade, to meet EU rules. These plants produce 6 million tpa of PFA. While half of this is used in the manufacture of building materials, such as concrete and building blocks, the rest is dumped in landfill, usually alongside the plants. Similarly, in the US, less than half of the 70 million t of PFA that is produced from over 300 plants is re-used.

While the generators want to sell the PFA to potential users, the current UK landfill tax regime has not delivered a change of behaviour to help encourage this valuable coal byproduct to be better utilised. This is not a sufficient deterrent to stop the disposal at PFA landfill dumps and there have been moves to reclassify this waste. Other waste that is considered active and is dumped will attract a £56/t tax from 1 April 2011. Importantly for the generators, though this tax regime may appear unfavourable, it could be introduced

gradually. Some 3 million tpa of PFA continues to be landfilled when it could be used – and hence not taxed – to offset a considerable proportion of the UK's coal generation carbon footprint in a unique and rather elegant solution.

Offsetting emissions

The statistics are encouraging. If 500 of these heavily gassing sites were capped using unused PFA and relandscaped, Lichen estimates millions of tonnes of CO₂ equivalent (tCO₂e) saving can be made, based on the modelling the company has made on three sites. This would depend on the gassing quality of the sites and would decline over the years, in line with the slow decline of coal burn in the UK as older plants are closed. New CCS on coal post-2020 would naturally reduce the need for coal to offset its emissions, but that is far into the future.

Based on this UK modelling, it can be calculated that Lichen's approach can save over 43 million tCO₂e over 40 years, thus allowing the coal industry a unique offsetting opportunity as it seeks to gradually reduce its carbon footprint in line with the EU's 2020 and 2050 emissions targets.

A global opportunity

This approach is novel and allows for a unique local solution. PFA from local coal-fired plants can be used to cap carbon and generate low carbon energy from local gassing landfill sites. It is a realistic and tangible offset using coal's byproduct, unlike some more disingenuous offsetting ideas.

Some 500 million t of PFA is produced globally each year. The coal sector can and must put this important byproduct to better use. The ability to use it to limit carbon emissions and its consequent inclusion in the clean coal solution may be unexpected and radical, but it should be a green concept for the coal sector to enthusiastically support.

Author

Tony Lodge is the Head of Research to the British Parliament's All Party Parliamentary Group on Clean Coal. He is author of *Clean Coal: A Clean, Secure and Affordable Alternative*, published by the Centre for Policy Studies where he is the energy research fellow.