Ultra-clean coal to power a greener future

May 13 2005

Engineers in Nottingham are developing ultra-clean coal that could make power generation 50% more efficient and reduce carbon dioxide emissions by a third. A team at The University of Nottingham is one of only two in the world working on ground-breaking techniques to purify one of the worldâ€™s main energy sources.

They have been awarded Â£120,000 to help them develop the ultra-clean fuel for the power stations of the future. Dr Karen Steel, of the School of Chemical, Environmental and Mining Engineering, said: â€œUltra-clean coal is seen as something of a Holy Grail in energy generation.

â€œItâ€™s a very efficient way of producing electricity, and itâ€™s also much less harmful for the environment. This is an exciting project in the sense that ultra-clean coal has world-wide applicability.â€?

When coal is dug from the ground, it contains about 15% mineral matter â€” including sulphates, oxides, clays, quartz and carbonates â€” which greatly restricts its use. A chemical leaching process being developed by Dr Steel and her team promises to reduce this figure to less than 0.1% â€” meaning much greater efficiency per tonne of coal and up to 33% less carbon dioxide (CO2) pollution from the power station.

CO2 emissions are implicated in global warming. Currently almost a third of such emissions in the UK come from power stations.

Most conventional coal-fired power stations burn coal to produce steam,

which turns turbines linked to a generator. Although efficiencies have gradually risen over the years, they are typically around 37 per cent, which means just over a third of the energy potential of the coal is converted into electricity.

But because ultra-clean coal can be burned directly in gas turbines, it has a potential efficiency of around 55 per cent â€" a relative increase of 50% from current levels.

Gas turbines are similar to aircraft jet engines and are a much more efficient way of using coal to make electricity â€" but normal coal cannot be used in them because impurities damage the turbine blades.

Dr Steel added: â€œThere has been an assumption that it would be too expensive to produce ultra-clean coal.

â€œBut our aim is to do it cheap, so the coal will sell for not much more than it would otherwise. There are potential markets for ultra-clean coal technology all over the world â€“ and not only for power generation. Ultra-clean coal could also be converted to carbon-rich products such as carbon electrodes used in aluminium smelting.â€?

The technique being developed at University Park has been dubbed â€œThe Nottingham process for ultra-clean coalâ€?. A grant of Â£120,000 has been made by the Engineering and Physical Sciences Research Council (EPSRC).

Ultra-clean coal could also help reduce the worldâ€™s dependence on oil, said Dr Steel. There are greater untapped reserves of coal, and they are generally located away from the politically sensitive Middle East. For example, China and the USA both have large reserves of coal â€" but not much oil.

The only other body working on ultra-clean coal technology is the Commonwealth Scientific and Industrial Research Association in Australia. They are investigating a different technique in pursuit of the same goal.

Source: University of Nottingham