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Carbon capture can drive a 21st century revival of British industry

AMBROSE EVANS-PRITCHARD

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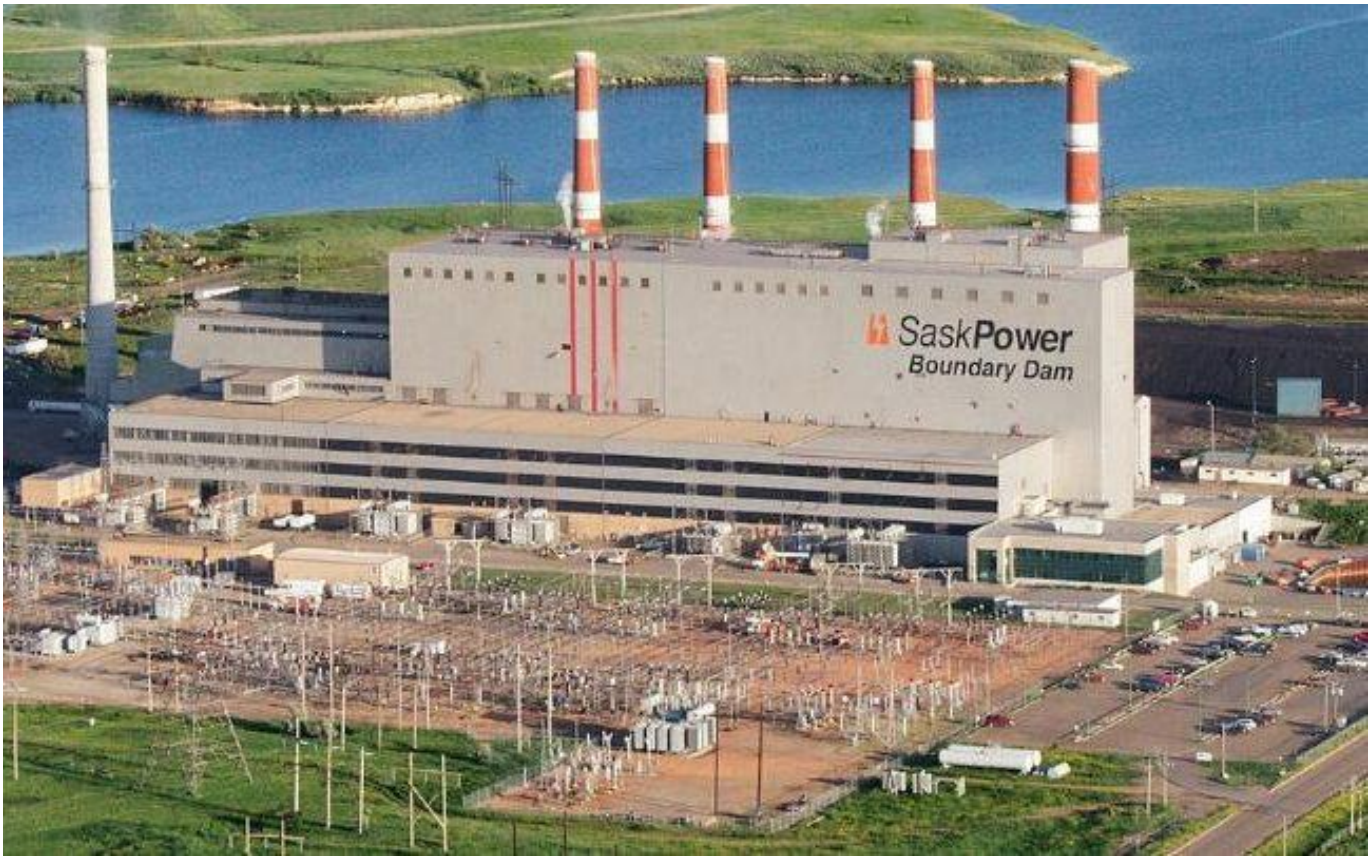


SaskPower in Canada has already kicked off carbon capture, but the greatest promise lies in Britain CREDIT: SASKPOWER

Renaissance beckons for the once great industrial hubs of northern England and Scotland, and the unexpected catalyst may be stringent global climate controls.

What looks at first sight like an economic threat could instead play elegantly to Britain's competitive advantage, for almost no other country on earth is so well-placed to combine energy-intensive manufacturing with carbon capture at a viable cost.

The industrial clusters of the Tees Valley and the Humber are linked by a network of pipelines to depleted and well-mapped oil and gas fields in the North Sea, offering rare access to infrastructure for carbon storage deep underground.

Liverpool has old wells of its own offshore in the Irish sea. Scotland's heavy industry in Grangemouth and the Forth have feeder pipelines to the Golden Eye.

Such sites may not be worth much today - with carbon prices in Europe too low to matter at barely $5 a tonne - but the COP21 climate deal agreed in Paris last December transforms the long-term calculus.

It implies a tightening regime of higher carbon penalties for the next half century, ending in net zero CO2 emissions. Once prices approach $50 a tonne the equation changes. Beyond $100 it inverts the pyramid of energy wealth: profits accrue to those with access to the cheapest low carbon power.

"Storage will be much more valuable than the fossil fuels themselves. If you are an energy-intensive industry in the middle of Europe and you don't have C02 storage, you're stuffed," said professor Jon Gibbins from Edinburgh University.

The Government's 'Heseltine report' into the regeneration of Teesside concludes that carbon capture and storage (CCS) could reap windfall gains. "This is a rare instance when existing industries can harness a new technology and ensure that Britain becomes a European and world leader," it said.

Britain is already a player in CCS technology. Shell Cansolv installed the world's first utility scale filtering system on a 110 megawatt coal-plant for SaskPower in Canada.

UK engineers Costain are managing a project for Emirates Steel Industries in Abu Dhabi, capturing the CO2 at source and transporting it in pipes for 'enhanced oil recovery' (EOR), a technique to extract more crude from depleted fields.

The UK Oil & Gas Authority says such EOR could extend the life of North Sea fields for another decade and generate an extra 250 million barrels of oil equivalent. Ultimately it could be much more, depending on global crude prices.

Yet Britain has not yet launched carbon capture at home. The Cameron government abruptly halted a £1 billion prize for two world-leading CCS projects last November, prompting a lascerating rebuke from the Commons Select Committee on Energy and Climate Change.

"The manner in which the carbon capture and storage competition was cancelled, weeks before the final bids were to be submitted and without any prior indication given to the relevant parties, was both disappointing and damaging," it said in February.

"The delay in bringing forward any subsequent plans seems to be in direct contradiction with the direction of energy policy. If Government does not come up with a clear strategy very soon, knowledge, investment, assets and expertise in the UK will all be lost," it said.

The suspension was a Treasury decision, a blunder made by a department in thrall to an austerity doctrine that should have no place in a depressed 1930s world awash with excess savings and offering the lowest bond yields in history.

The British state can borrow for twenty years at 1.23pc. It should do so without hesitation for the infrastructure projects that pay for themselves, and this one plausibly promises to transform the 'Northern Powerhouse' from pious rhetoric to hard reality. It is investment on steroids.

The drastic implications of COP21 are still sinking in. A maximum 'carbon budget' of 3,000 gigatonnes - deemed necessary to stop temperatures rising more than 2 degrees Celsius above pre-industrial levels - may mean zero emissions from the power sector by mid-century.

"There are areas like farming and aircraft travel where it is tougher to drive down emissions, so other areas will have to go negative to meet the target," said prof Gibbins. The term 'negative' is confusing but it essentially means combining CCS with bioenergy.

The accord was signed by 195 countries, led by the US and China. It makes no difference whether you accept the hypothesis of man-made global warming. The deal constitutes the political will of the world, and will be legally-binding in the sense that each state transposes its commitments into domestic law.

It is possible that Donald Trump will be elected US president and that the global consensus will unravel. But Britain cannot make strategic plans based on what a putative President Trump might or might not do, and I write this article on the assumption that COP21 will remain the global framework.

A study of Britain's CCS potential for the old Department of Energy and Climate Change (DECC) concluded that there are five optimal sites that can meet the UK's needs and service Europe.

"There are no major technical hurdles. The UK is endowed with offshore geology that presents a superlative national CO2 storage proposition," it said.

The cradle-to-grave "levelised unit cost" of transport and storage (not the separate CCS process itself) ranges from £11 to £18 per tonne of CO2, adding £5 to £9 per megawatt hour (MWh) to electricity costs.

The capital cost covering all sites is estimated at £4.4bn with an offshore lifetime of forty years, with £6bn of operating costs.

Carbon capture is still in its infancy, like wind and solar twenty years ago, before an avalanche of subsidies created the scale needed to jump-start the technology. Shell expects a similar "race down the cost-curve" for CCS, ultimately undercutting offshore wind by a big margin.

Luke Warren from the UK's Carbon Capture and Storage Association says gas-fired CCS could drop to £85 per MWh by the late 2020s, comparable to other renewables by then but with the advantage that it serves as "dispatchable" power whenever needed. It does not suffer from the curse of intermittancy. "We think costs will come plummeting down but it needs government intervention to develop the infrastructure," he said.

Canada's SaskPower plant has at least shown that it can be done, extracting 90pc of the CO2. It loses 18pc of the power, the so-called "parasitic load", better than feared.

The utility says it has learned so much from its first trial and error efforts that it could cut 30pc off the cost of the next plant. Yet the project is so heavily subsidised that it tells us little about the likely economics of CCS in the 2030s.

Nobody will know what the cost-curve looks like until the Government has taken the plunge, and it would be feckless for Britain to try and coast as a "late mover" on the uncertain efforts of other countries with less geographic incentive to act.

The Green movement is split on carbon capture. Friends of the Earth calls it a "20th century concept" that keeps the current fossil-based energy mode alive. "Rather than being a solution, it risks perpetuating the problem". This neglects a salient fact that steel, cement, and chemical plants - among others - emit large amounts of CO2 as part of the industrial process, regardless of whether their electricity is from renewables.

Greenpeace calls CCS a "risky distraction", fearing CO2 leakage and further acidification of the oceans. This is certainly a legitimate concern. But then it switches tack - in an odd alliance with climate sceptics - asserting that "CCS doesn’t work" and that the technology an exorbitant failure everywhere. "There isn’t a single commercial-scale power plant capturing and storing its emissions," it states.

Greenpeace is making its case based on a snapshot of today's cost, rather than envisaging what CCS would look like with scale and start-up funding. Fair enough, but that is not the way it argues when pushing for renewables.

Their view is not shared by most climate policy experts. Britain's official Committee on Climate Change says carbon capture is likely to be a "crucial part of the least-cost path to decarbonisation in the UK, and globally."

The International Panel of Climate Change estimates that it would cost 140pc more to meet the Paris goals without CCS technology - given what we now know about alternatives. A new research paper by Imperial College London concludes that renewable energy and CCS together are absolutely imperative. "It is not a case of one or the other," it said.

Britain has a chance to revive its programme when Lord Oxburgh reports to the government next month on the future of CCS. For Teesside it may be the difference between revival and irreversible decline.

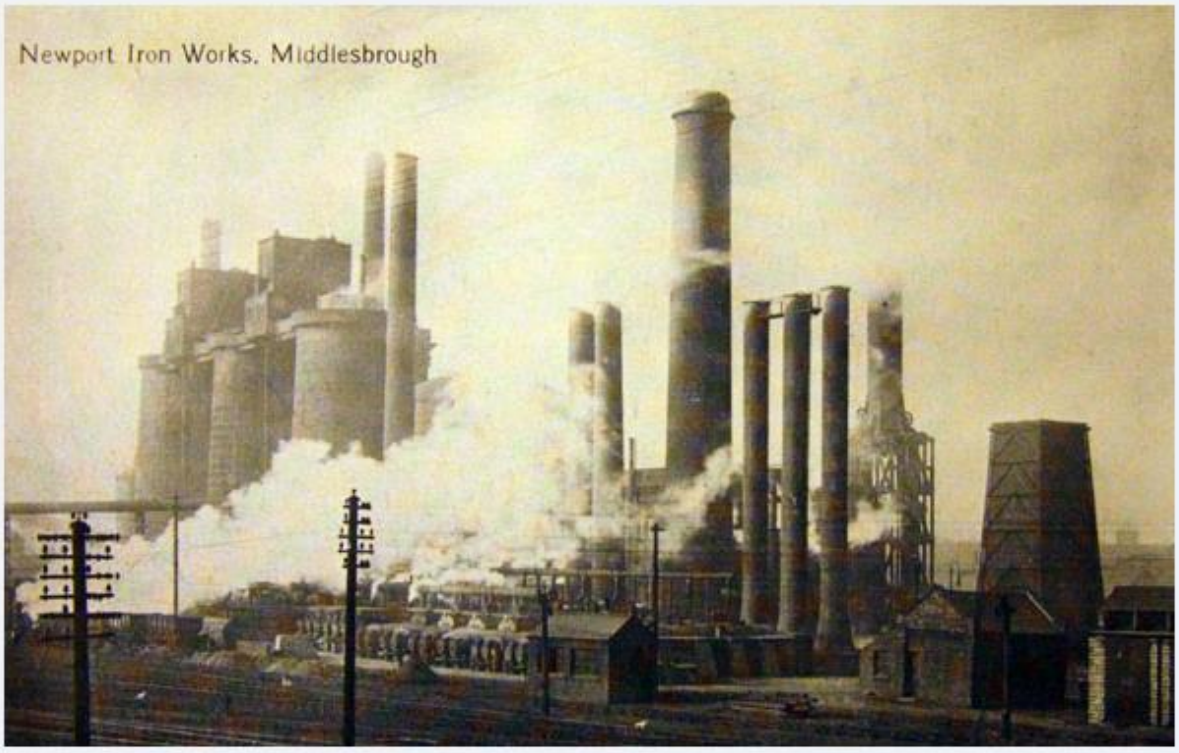
Horses racing the world's first railway from Darlington to Stockton in 1825 CREDIT:THISISSTOCKTON

Teesside's resilience has been extraordinary. The valley has somehow held on after so many of its industries were abandoned to their fate in the 1980s, and it then had to face the threat of Chinese mercantilism. The valley is still home to 58pc of Britain's chemical industry.

But its Achilles Heel is the cost of power. Five of the UK's top 25 CO2-emitting plants are packed together between Darlington and the mouth of the North Sea.

There is a poignant history to Teesside. It was there that the Industrial Revolution reached full flowering with opening of the Stockton & Darlington railway in 1825, proceeded by a man on a horse with a flag reading Periculum Privatum Utilitas Publica - no translation needed for *Telegraph* readers.

The line carried coal from the Durham mines to the river. By the 1860s Teeside hosted the greatest iron works in the world. Its steel later supported the Sydney Harbour Bridge and the London Shard - until Thai-owned SSI finally shut down the last furnaces at Redcar in October. Let us hope that is not the last sad chapter.



Teesside's Newport Iron Works in its glory days when the valley was the world's top producer

I have tried to float a few ideas this August on how to fashion a British energy policy fit for the 21st Century. The list is inadequate. I have not even touched on the possibilities of geothermal energy, or even the simple expedient of flooding old mines to generate warmth through heat exchangers.

I have barely mentioned the forgotten drive for energy efficiency, 40pc of the gains needed by 2050. Nor have I explored the potential of power-to-gas conversion through electrolysis, a break-through that could store energy for months and overcome the seasonal variations of wind and solar.

Thank you to those on the front-line who have sent me breath-taking material on scientific advances. You have left me more convinced than ever that humanity is about conquer this challenge. I now return to my normal job covering the world economy.