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No magic fix for carbon

Carbon capture and storage projects promise to make a dent in global emissions — but only as part of a broader programme of technology deployment and economic incentives.

The international pantomime that is climate-change politics is filled with heroes and villains, who jump onto and off the stage and trade places as time passes and the focus of attention changes. But one character endures: the fairy godmother, a single brilliant idea or advanced technology who with a single wave of her wand can introduce some magic to save the planet. It is a seductive and appealing plot twist, partly because it guarantees a happy ending, and partly because that happy ending comes about without any serious sacrifice by the dramatis personae. This *deus ex machina* principle of screen-writing — plot the hero or the world into a seemingly impossible corner and have the solution appear from nowhere in a puff of inspired smoke — infuriates science-fiction fans everywhere.

Over the past decade or so, carbon capture and storage (CCS) has been the fairy godmother of climate change, or at least of the politicians who have pledged in ever more ambitious terms to tackle the problem. Dig into most political promises to slash greenhouse-gas emissions by headline amounts — 80% by 2050, that kind of thing — and there she is. A significant proportion of the promised cuts are the result not of declines in carbon dioxide production, but of attempts to trap damaging emissions at source and divert them under the ground rather than into the atmosphere. Clean coal, CCS technology, capture-ready: the idea has spawned its own subplots and terminology. Regulations on carbon pollution permitted from new fossil-fuel-fired power plants are also being drawn up, on the assumption that CCS is feasible, and that it can be implemented on a massive scale.

Some of this political ambition has been backed with public investment. According to the International Energy Agency (IEA), from 2007 to 2012 more than US$12 billion of public funds around the world were made available to projects to demonstrate that the concept could work. Impressive perhaps, but hardly sufficient. The IEA has also said that to make the promised contributions to emissions targets, by the middle of this century CO_2 storage would have to be a well-developed industry in its own right — bigger than last year's global oil and gas industry, with all of the associated infrastructure. About 25 million tonnes of carbon dioxide are already piped under the ground each year for a variety of reasons. The IEA says that must rise to 7 billion tonnes by 2050.

As we report on page 20, two coal-fired power plants in North America are preparing to nudge up the modest annual amount of CO_2 sequestered. The Boundary Dam Power Station in Saskatchewan, Canada, will probably be first. It is scheduled to switch on later this year, and if it does so it will win a global race. For the first time, a commercial-scale plant that supplies electricity to the grid will capture and store most of its emissions, about 1 million tonnes of CO_2 a year. (Whether this is a good thing for the environment depends on your point of view: the gas will be sold to an oil company and squeezed underground to help to flush out the stubborn reserves of an oilfield.)

Following close behind is a more modern coal plant in Kemper County, Mississippi, designed to capture 3.5 million tonnes of CO_2 a year — about two-thirds of its total emissions. This captured gas will also go towards enhanced oil recovery when the plant starts to operate towards the end of this year.

The concept works. The question is, at what cost? As Howard Herzog, a CCS researcher at the Massachusetts Institute of Technology in Cambridge, says in the News story: "The technology is ready to go. The problem is that policies aren't in place to make projects economic." Well, quite.

"Carbon capture and storage has been the fairy godmother of climate change, or at least of politicians."

The commercial market for CO_2 is small and unlikely to expand any time soon. Schemes to make companies pay for their emissions were intended to penalize polluters and level the playing field for clean but pricey alternatives, but they are struggling. However cheap CCS technology might get, a coal or gas plant that scrubs its exhaust gases to capture the carbon will always be more expensive to run than one that does not — making it the first to be turned off when demand for electricity falls outside peak times.

Many questions remain about the long-term viability of a serious and sustained CCS contribution to the global effort to reduce greenhouse-gas emissions, not least how to guarantee that stored carbon stays stored. But by this time next year, the coal plants in Saskatchewan and Mississippi could give politicians around the world sufficient proof that the concept can be deployed — not as a fairy godmother to spirit away their problems, but as part of a broader suite of technologies. Then they just have to decide what to wish for. ■

False positives

A correlation between error rate and success undermines promise of stem-cell trials.

When it comes to stem-cell therapies, the stakes are high — but not as high as the hopes of people who are severely ill. Over the past few years, dozens of small, early-phase clinical trials have tested the value of adult stem cells in treating debilitating or life-threatening heart disease. Results have been mixed, but most peer-reviewed academic reports have hinted that patients may be helped. This has, understandably, encouraged clinicians to move potential therapies into large and expensive phase III trials to establish whether the treatments can fulfil their promise.