

Cool Energy's captured CO₂ idea can catch on

With Australia moving steadily towards a carbon-constrained economy, attention is focusing on the nation's huge reserves of natural gas. Gas-fired generators have about half of the emissions of black coal, and about one-third those of brown coal plants.

But new research is looking at ways to reduce even these emissions, by capturing significant amounts of carbon dioxide from natural gas at the well head.

Martin Wilkes, projects manager with Perth-based Cool Energy, a company developing crucial technology in the field, explains that natural gas is not perfect as an energy source.

"Just about all gas fields contain carbon dioxide that must be removed before being transported," he says. "Some gas fields have much higher carbon dioxide content than others, and in some cases if this carbon dioxide is removed and emitted at the well head, the total associated emissions could be higher than coal. In fact, some gas fields contain so much carbon dioxide that

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A Perth-based company has a way to trap and store environmentally-unfriendly emissions at gas well heads, writes **Derek Parker**.

development with conventional technologies has not been feasible. "Our aim is to capture the carbon dioxide from natural gas at the well head, and to do it in the most cost-effective way."

Cool Energy has developed a technology called CryoCell, which involves reducing the temperature of the gas stream to between minus 80 and minus 90 degrees. This solidifies the carbon dioxide and other contaminants, which are then separated from the stream by gravity. The carbon dioxide is then heated and melted, creating a cold liquid, suitable for transport.

The resulting vapour stream meets pipeline sales gas specifications and can be delivered directly to consumers. The principle might sound simple, but development was a complex task. The laboratory tests were

performed by Robert Amin between 1999 and 2003, at the Woodside Hydrocarbon Research Facility, a joint initiative between Curtin University and Woodside Energy.

In early 2005 Cool Energy received funding from investors and a start-up grant from the Australian government, and then gained approval to build a demonstration plant near Dongara in Western Australia. It was commissioned in 2006 and successful tests were completed in 2007.

Shell has secured the use of the original patent rights from Cool Energy with the intention of large-scale plant development.

"Cool Energy undertook the field trials in the Perth Basin in partnership with Arc Energy, Curtin University and Woodside Energy. I see this project as an example of successful collaboration between

academia, business, and government," says Wilkes. "Since the successful completion of trials we have been actively moving towards full commercialisation. We are now at the stage of lining up finance to move to the development phase. Our first facility is likely to be in South Australia, in the Cooper Basin. But there is also strong interest from Indonesia, and from several other Asian countries."

The other part of the equation is storage of the carbon dioxide removed from the gas stream. Cool Energy has signed a memorandum of understanding with geoscience company Greenhouse Gas Storage Solutions on developing geosequestration solutions.

"It's time to move carbon dioxide capture and storage from the realm of theoretical research to industrial deployment," says GSSS chief executive officer John Bradshaw.

"Applied to sites with the appropriate geological characteristics, geosequestration is a safe, reliable and very effective solution." Bradshaw, a lead author for the intergovernmental panel on climate

change, notes that GSSS is already involved in national and international projects examining sites for geological storage.

"Geosequestration of carbon dioxide captured by our process could use depleted gas fields or saline aquifers," says Wilkes.

"That is, places where the geology is known and understood. It should be realised that gas treatment and geosequestration is already taking place on a significant scale. The Sleipner facility operated by Statoil in Norway has been sequestering a million tonnes of carbon a year from treated gas for 10 years. There is also another project in Norway, at Snohvit, as well as at Weyburn in Canada, and In Salah in Algeria, all sequestering commercial amounts of carbon dioxide."

Wilkes notes that plants such as Sleipner use chemical solvent to treat the gas. Cool Energy's technology, he says, is much more efficient, in cost and energy terms.

"We are very aware that carbon capture has to be financially viable if it is going to be widely adopted," he says. "We have put a lot of effort into getting the numbers right."