Storing carbon dioxide underground

While proponents of carbon capture and storage say it will enable Australia to achieve the deep cuts in emissions needed to prevent dangerous climate change, critics say it's risky and expensive.

In April, the Cooperative Research Centre for Greenhouse Gas Technologies (CO_2CRC) started the country's first commercial-scale, scientifically monitored trial of geosequestration – the storage of large volumes of carbon dioxide in deep underground saline aquifers or sandstone 'reservoirs'.

Over the course of 18 months, researchers will inject 100,000 tonnes of compressed CO_2-rich gas into a depleted natural gas field two km below the surface and about 30 km east of Warrnambool in Victoria's south-west, within a geological formation known as the Otway Basin. As well as demonstrating the viability of geosequestration, the project aims to evaluate monitoring and operational procedures for future commercial implementation.

The CO_2 source used in the $40 million project – involving scientists from Australia, New Zealand, the US, Canada, Europe and Asia – is natural gas from an existing production well (Buttress-1), which will be compressed, liquefied and pumped into the nearby Naylor-1 depleted natural gas field.

Dr Peter Cook, Chief Executive of the CO_2CRC, says selection of geosequestration sites is critical as they need to have a simple geology – no active faults, a layer of sandstone or other porous rock (or a saline aquifer), adequate storage capacity and a natural impervious 'cap' to trap the gas.

"Naylor-1 is a well-characterised site with proven storage capacity, having previously stored natural gas for millions of years," says Peter. "We have access to an enormous amount of information because it is a depleted gas field, so we have a good idea of how the fluid-like gas will move through the rock.

"The Intergovernmental Panel on Climate Change considers that at a carefully chosen CO_2 geosequestration site, less than one per cent of the stored CO_2 would leak into the rock layer immediately above the storage reservoir – not the atmosphere – over 1000 years. The CO_2CRC is confident of achieving this level of storage security for the Otway Basin project."

The CO_2CRC has equipped the deep Naylor-1 monitoring well with seismic equipment to track horizontal movement of CO_2 through the reservoir, as well as equipment to measure CO_2 levels in surrounding groundwater, soil and air.

"We are taking every precaution to monitor the surface, subsurface and atmosphere," says Peter. "There is a lot of natural variability of CO_2 which is why we set up baseline monitoring in 2006."

No risk to nearby farms

A key objective of the monitoring program is to reassure the local dairy farming community that the stored CO_2 will not pose a risk to their farms or families. The CO_2CRC has established a community consultation program that includes regular newsletters and mailouts and meetings between local people and CRC researchers.

Peter says future challenges include finding deep storage sites close to power stations, bringing down costs and over-

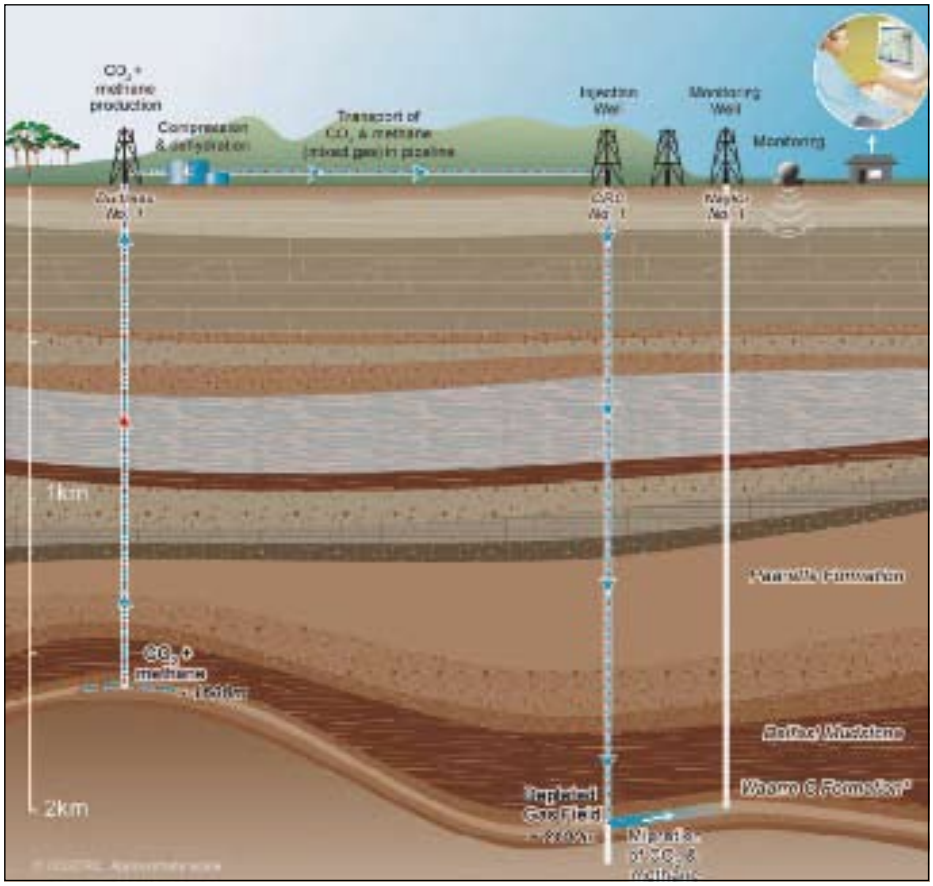
coming technical hurdles in developing commercially viable processes for the other component of carbon capture and storage (CCS) – separating CO_2 from power station flue gases.

John Connor, CEO of the Climate Institute – an independent organisation set up to educate the public about climate change – says CCS 'has the potential to play a significant role as a transitional clean energy technology if operational and commercial hurdles can be overcome'.

"If it proves viable it will greatly help the transition to a clean energy future. But it's important that we hit 2020 with a clear idea about its viability. Advanced trials or even commercial plants need to be in operation by 2020, alongside a suite of other renewable technologies.

"The coal industry needs to improve investment but there should also be better policy support. And we need balanced public funding for clean energy technologies."

More information: CO_2CRC, www.co2crc.com.au



The Otway Basin site has the ideal geology for carbon storage – a depleted gas field at more than two km depth, with a cap of impermeable mudstone.