Geosequestration: its role in a sustainable future for New Zealand gas resources

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Fossil fuels are predicted to remain an essential element of New Zealand's sustainable energy future for decades. Ensuring the sustainability of fossil fuel use through the reduction of associated carbon dioxide (CO_2) emissions is becoming a worldwide focus for industry research. The long-term subsurface storage of CO_2 (geosequestration) is one option to enable New Zealand to meet its sustainable energy aims. In addition, the exploitation of NZ gas resources faces a challenge under the carbon charge due to the high CO_2 content frequently encountered in natural gas reservoirs.

In partnership with the Australian geosequestration research project CO2CRC, projects are underway in NZ to characterise storage sites, to understand the effect of CO_2 injection on reservoir and seal properties, to evaluate the role of fault seal and active tectonics, and to analyse the baseline flux of CO_2 overlying natural CO_2-rich gas reservoirs. Site characterisation, predictive modelling, and the development of monitoring technologies are planned. Storage options in NZ include deep aquifers, coal seams, dry structures in sedimentary basins, and depleted gas reservoirs. Fundamental to the development of geosequestration projects in New Zealand is a National Site Inventory to identify and highgrade these options, mirroring assessment studies for Australia. GNS has developed a Geographic Information System with a data structure capable of handling the diverse data sets required for sequestration projects. The GIS is populated with data on natural and anthropogenic sources of CO_2, and infrastructure relevant to transporting CO_2 between source and sink.

Regions accommodating potential sequestration sites have been delineated by an 'Expert Group' of regional geologists and specific sites within high-graded regions are being identified. The evaluation of information to assess probable risk, identify location in relation to present and planned CO_2 sources, and rank potential sites for detailed site assessment studies is on-going.

Petroleum basins are attractive options in NZ due to the large storage volumes available, the knowledge and understanding of this setting, and the existence of CO_2 rich reservoirs in these basins. Technology and expertise for separation of CO_2 from natural gas, and re-injection into the subsurface, is well-established in the NZ gas industry. However, policy development - and public outreach - must be pursued in parallel with technical characterisation of storage sites.

Significant challenges exist to the adoption of geosequestration.. NZ is geologically different from other regions where geosequestration is currently being developed. Our active tectonic setting affects every aspect of subsurface fluid flow. Volumetrically-significant valid storage sites are distal from large point source emitters, requiring that the economic attractiveness of geosequestration may rest on emission credits, or use of CO_2 for enhanced gas and liquid recovery. Despite these challenges, the development and operation of a geosequestration hub in Taranaki will be an essential element of the future of our industry.

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