



GROUND AND SURFACE WATERS

GISERA | Gas Industry Social and Environmental Research Alliance

Beneficial reuse and disposal options for brine in Queensland

Scientists from CSIRO, Australia's national science agency, will undertake a review of potential options for reusing and disposing of the large volumes of brine that are a by-product of coal seam gas (CSG) activities in the Surat and Bowen basins, Queensland.

Key points

- Growth in demand for natural gas has led to a rapid increase in the production of CSG from the Bowen and Surat Basins.
- The CSG fields in the Surat and Bowen basins generate large volumes of produced water that is rich in various chemicals and salts.
- Processing this water produces a highly saline brine by-product, and communities have expressed concern about how this will be managed.
- This CSIRO project evaluates a range of potential options for the beneficial reuse, management and disposal of brine.

Through desktop review, a sampling and characterisation program, and techno-economic analysis, researchers will evaluate a range of potential options.

Project outcomes will help address community concerns in the region about how to manage the large volumes of brine that are being produced.

Research results will also provide a science-based input to the Queensland Government's CSG Brine Management Action Plan (2023) which recognises the need for further research into options for brine management.

The Bowen and Surat basins

Southern Queensland hosts the largest CSG producing fields in Australia with production commencing in the Bowen Basin in the 1990s and in the overlying Surat Basin in 2006.

The majority of CSG production is from the Surat Basin, with production extending from Dalby in the southeast to about 80km south of Rolleston. Production from the Bowen Basin extends from Moura north to Glendon.

This project, conducted through CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA), aims to review the beneficial reuse, management and disposal of brine generated by CSG activities in the Surat and Bowen basins.

Examples of CSG water holding ponds from Queensland (above) and New South Wales (overleaf).



Brine as a by-product of CSG activities

The production of CSG requires the extraction of groundwater to reduce pressure within the coal seams and allow the release of the gas. Significant volumes of water are extracted – currently around 54,000 megalitres per year (ML/year) in the Surat and Bowen basins – and this water contains high concentrations of naturally occurring salts.

The predominant management option for this water is through the reverse osmosis (RO) process, which is highly effective in removing salt from solutions. It produces treated water (called permeate), which can be reused for beneficial purposes, along with a highly concentrated brine solution.

The brine is considered a waste product, with no current beneficial reuse identified. Over the life of CSG activities in Queensland, the total volume of brine produced will contain approximately five million tonnes of solid salt.

Local communities have expressed concern about how brine will be managed. This CSIRO study aims to address those concerns by assessing the pros and cons of potential options for the beneficial reuse, management and disposal of brine.



Project methods and outcomes

The project has four key objectives:

- collate existing data and information on produced water and brine generated due to CSG activities in the Surat and Bowen basins
- conduct sampling and characterisation of brine from the Surat and Bowen basins
- undertake a review of existing and emerging innovative technologies and solutions for beneficial reuse, management and disposal options
- conduct a techno-economic analysis of each of the options identified.

A key consideration in examining potential beneficial reuse and disposal options is the characteristics of the brine, which is why a field sampling and characterisation study are required in addition to the review of existing data.

While the bulk composition of brine is reasonably well understood, there are additional complexities – including spatial and temporal variations, ingress of material, and biological processes – that influence the physical and chemical characteristics of brine and will influence beneficial reuse, management and disposal options.

Previous studies considering options for the beneficial reuse and disposal of CSG brines in Australia have identified a number of technically viable options, including selective salt recovery (reuse) and salt encapsulation (disposal).

A combination of changing policy environments and emerging technologies also means that some options previously considered commercially unviable may now be more feasible. For examples, carbonates can be used for renewable energy storage or synthetic production of nitrates for renewable energy heat transfer applications.

A high-level techno-economic analysis, which takes into account the physical and chemical properties of brine and assesses how those might impact the performance of the different technologies, will help identify which options may be most suitable for further investigation or development.

Taken as a whole, the project outcomes will provide industry, governments and communities with valuable information to assist decision making around the management of brine.

More information

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.