

Unconventional gas

Supporting sustainable development of coal seam gas and shale gas industries.

Current projects

MICROBIALLY ENHANCED COAL SEAM GAS

Through an industry consortium project, CSIRO has developed methods to increase gas content in coal by stimulating natural microbial activity. The project has established detailed and quantitative knowledge of methane biogenesis and the addition of nutrients to optimise the activity of microbial populations in generating methane. The outcomes of the project is anticipated to deliver direct benefits to the CSG industry, providing increased and prolonged gas production from depleted and unproductive coal seams in Australia and add value to existing CSG production.

Ultimately microbial technologies and application may enable the conversion of carbon dioxide to methane, providing additional capacity for the geological storage of carbon dioxide.

MEASUREMENT AND MODELLING FOR FUGITIVE EMISSIONS

CSIRO and the Department of Industry, Innovation, Climate Change, Science Research and Tertiary Education are collaborating to provide preliminary data based on field measurements and modelling of methane emissions from a sample of CSG production facilities in New South Wales and Queensland.

The project will develop robust and consistent measurement techniques to quantify and monitor fugitive emission fluxes from various parts of the production process (e.g. wells, surface infrastructure) and facilities. It will also yield the first quantitative measurements of fugitive emissions from Australian CSG production facilities. Ultimately this research will lead to the development of suitable Australian-specific methods for monitoring and quantifying fugitive emissions, underpinning the development of effective environmental and industry regulation.

SHARC2 – RESOURCE CHARACTERISATION AND RESERVOIR PERFORMANCE OF GAS SHALES

SHARC2 is a joint industry project investigating the links between geomechanics, rock physics petrophysics and

microstructure in gas shales, with a specific focus on the impact of partial saturation and organic matter. Taking a micro-to-macro, experiment-to-theory, lab-to-field approach, the project will improve understanding of gas distribution, rock properties and production potential. The results will provide better certainty to rock physics, petrophysics and reservoir models to improve decision making for shale gas plays.

GISERA

The Gas Industry Social and Environmental Research Alliance (GISERA) was founded by CSIRO and Australia Pacific LNG, bringing industry and science together to undertake research in five key social and environmental areas: groundwater and surface water, biodiversity, land management, the marine environment and socio-

economic impacts. The focus of GISERA is to deliver 'public good' science to shape and guide the CSG/LNG industry with benefits to broader community and industry.



Research and development opportunities

EXPLORATION		
<ul style="list-style-type: none"> ♦ Integrated reservoir characterisation ♦ Gas storage and flow mechanisms ♦ Permeability ♦ Partial saturation 	<ul style="list-style-type: none"> ♦ Role of organic matter ♦ Predicting producibility – identification of high production fairways ♦ Simulation of reservoir performance 	
PRODUCTION		
Drilling and well construction	<ul style="list-style-type: none"> ♦ Complex geometry, multilateral wells ♦ Bit-rock interaction ♦ Bit design ♦ Drilling systems – vibrations, direction drilling 	<ul style="list-style-type: none"> ♦ Well integrity and stability – casing, cementing ♦ Wellbore stability modelling
Reservoir engineering and stimulation	<ul style="list-style-type: none"> ♦ Hydraulic fracturing including monitoring 	<ul style="list-style-type: none"> ♦ Enhanced coal seam gas production – microbial and CO₂ injection
Production modelling	<ul style="list-style-type: none"> ♦ Free vs adsorbed gas ♦ High pressure and temperature gas adsorption characteristics for shale gas reservoirs ♦ Fracture flow processes – CT core scanning ♦ Multi-component gas adsorption 	<ul style="list-style-type: none"> ♦ Dual porosity systems ♦ Coal swelling dynamics ♦ Permeability coupled to geomechanical processes
PROCESSING		
Gas processing and conversion	<ul style="list-style-type: none"> ♦ Downscaling of gas processing and conversion equipment 	
WATER MANAGEMENT		
<ul style="list-style-type: none"> ♦ Predicting and managing impacts and risks of gas production for surface and groundwater resources ♦ Geochemical response of aquifers to reinjection of permeates and brines from treatment of CSG associated water 	<ul style="list-style-type: none"> ♦ Managing reinjection, well clogging ♦ High-performance groundwater modelling for large scale injection schemes 	<ul style="list-style-type: none"> ♦ Upscaling highly non-linear flow processes associated with depressurisation of coal seams for CSG development
ENVIRONMENTAL IMPACT RESEARCH		
<ul style="list-style-type: none"> ♦ Tracer analysis and sensors ♦ Geological site description ♦ Seismic surveys ♦ Formation pressure measurements 	<ul style="list-style-type: none"> ♦ Hydrodynamic assessments ♦ Water sampling and analysis ♦ Geochemical and isotopic characterisation of formation waters, aquifers and springs 	<ul style="list-style-type: none"> ♦ Environmental impacts of coal seam dewatering
FUGITIVE EMISSIONS		
<ul style="list-style-type: none"> ♦ Baseline monitoring ♦ Identification of sources 	<ul style="list-style-type: none"> ♦ ‘Bottom-up’ and ‘top-down’ emission quantification approaches 	<ul style="list-style-type: none"> ♦ Hyperspectral methods ♦ Total lifecycle analysis
ASSESSING TECHNOLOGY ACCEPTANCE AND THE SOCIAL LICENCE TO OPERATE		
Technology assessment	<ul style="list-style-type: none"> ♦ Inform and enhance stakeholder understanding of the implications of new and existing technologies 	<ul style="list-style-type: none"> ♦ Improve the technology’s development, its scientific outcome and its relevance to society
Social licence	<ul style="list-style-type: none"> ♦ Research on the relations between industrial activity, local communities and broader society in Australia 	<ul style="list-style-type: none"> ♦ Delivering insights and tools to help operational stakeholders understand their social licence to operate

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AT CSIRO WE SHAPE THE FUTURE

We do this by using science to solve real issues. Our research makes a difference to industry, people and the planet.

FOR FURTHER INFORMATION

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