About coal seam gas

What is coal seam gas?

Coal seam gas (CSG) is a form of natural gas that occurs in coal seams laid down mainly during the Permian period, between 299 million and 251 million years ago. In NSW the coal seams targeted for gas production are generally found between 200 metres and 1000 metres below the ground. CSG is typically 95 to 97% methane (CH₄) with minor amounts of nitrogen, carbon dioxide and other gases.

In the USA much of the methane being extracted is in shale. CSG differs from shale gas in a number of ways. Shale gas comes from shale which is a hard sedimentary rock with low permeability. That is, rock that does not allow water or gas to pass through easily.

Because of this, shale generally requires extensive hydraulic fracturing to extract the gas. There is little interest in gas extraction from shale in NSW, largely because of the significant coal deposits and the added difficulties and costs involved.

Coal seam gas does not generally require hydraulic fracturing for its extraction. It is the exception rather than the rule. To date less than 5% of CSG wells in Australia have been fracked, and this figure is unlikely to exceed 10%.

Why extract coal seam gas?

As energy demands continue to grow in Australia, CSG has the potential to become an important energy source. CSG is used for heating and cooking, it is used to produce electricity by fuelling large electricity generators and it can be converted to liquefied natural gas (LNG).

CSG burns cleaner and more efficiently than coal and is an alternative lower carbon energy source producing less greenhouse gas emissions than coal per unit of energy supplied.

How is it extracted?

CSG occurs within the coal seam bed itself. This is different from natural gas traps that occur in geological structures. The gas within coal seam beds is kept in place by the pressure of groundwater and the overlying geological formations.

To extract the gas, the pressure of the water in the coal seam must be lowered. This is done by pumping water from the coal seam to the ground surface through a specially constructed well.

The following diagram shows what happens to groundwater flow when a coal seam gas production bore is operating. In most situations the vertical component of water flow is much smaller than the horizontal component as shown by the arrow sizes.
How are coal seam gas impacts on water regulated?

Exploration and production activities for CSG and their potential impacts on water sources are regulated by both NSW and Commonwealth government agencies.

Over the past two years a number of measures including legislation, policies, plans, guidelines and codes of practice have been introduced by the NSW Government to ensure stringent regulation of the CSG industry in the state.

In 2011 the NSW Government banned the use of BTEX chemicals (benzene, toluene, ethylbenzene and xylene compounds) in CSG fracking fluids and banned the use of evaporation basins for the disposal of CSG produced water.

The NSW Aquifer Interference Policy was released in September 2012 and ensures that the impacts of CSG and other mining developments on groundwater resources are now subject to greater scrutiny and control.

The Aquifer Interference Policy sets out licensing requirements for the water taken from water sources through CSG and other mining activities. It also defines the process through which the NSW Office of Water will assess projects to determine any potential impacts on aquifers. The assessment process will be based on ‘minimal impact considerations’ including the potential risk of groundwater movement between aquifers, impacts on the water table, water pressure levels and water quality changes in different types of groundwater systems.

The Office of Water will assess each application against the requirements in the Aquifer Interference Policy and will then advise either the Minister for Resources and Energy, the Gateway Panel, the Planning Assessment Commission or the Minister for Planning, depending on the nature of the proposed development.

Two codes of practice applying to hydraulic fracturing and CSG developments were released by the NSW Government in 2012 to strengthen the controls applying to gas exploration and production.

The NSW Government will also establish a best practice framework for coal seam gas exploration activities in NSW, including the protection of water sources, through a Code of Practice for Coal Seam Gas Exploration.
Glossary

- **Brackish water** – water that has a salinity of between 3000 and 7000 mg/L total salts, but is not as salty as seawater.
- **Brine** – highly concentrated salty water more saline than sea water.
- **BTEX** – an acronym for benzene, toluene, ethylbenzene, and xylene, compounds typically found in petroleum products.
- **Coal** – a carbon rich combustible organic sedimentary rock formed by the accumulation and decomposition of plant material.
- **Fracking additives** – chemicals added to hydraulic fracturing fluid for a number of purposes including microbial control, pH buffering, clay management, lubrication, viscosity control and corrosion inhibition.
- **Groundwater** – water that occurs beneath the ground surface below the water table. Groundwater quality and yield vary greatly depending on the characteristics of the host geology and the amount of recharge a groundwater system receives.
- **Hydraulic fracturing** – (or ‘fracking’) the process of injecting fluids containing a proppant under pressure to fracture a rock and enhance its permeability thus improving the ability for water and gas to flow to a well.
- **‘Make good’ provisions** – the requirement to ensure third parties have access to an equivalent supply of water through upgraded infrastructure or by other means such as deepening a bore, funding extra pumping costs or building a new pipeline or bore.
- **Minimal impact considerations** – factors set out in the Aquifer Interference Policy that need to be assessed to determine the potential effect of aquifer interference activities on groundwater and its environment.
- **Monitoring bore** – a specially designed bore used to measure groundwater levels, pressures and quality at specific depths in the ground.
- **Permeability** – the measure of the ability of earth materials to transmit a fluid.
- **Petajoule** – Is a measure of energy, work, and heat.
- **Produced water** – the water that is produced from a CSG well along with the gas during normal CSG production.
- **Proppant** – sand sized particles consisting of sand or small ceramic grains used in hydraulic fracturing. They hold open fractures in the coal and allow gas to be released.
- **Sedimentary rock** – rock formed by layers of sediment.
- **Water table** – the depth at which soil spaces, fractures and voids in rock become completely saturated with water.

More information
www.water.nsw.gov.au
www.resources.nsw.gov.au

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