



Finding the best use for coal seam gas water



Australia Pacific LNG Project

Australia Pacific LNG is the leading coal seam gas (CSG) producer in the Queensland natural gas industry. The joint venture between Origin, ConocoPhillips and Sinopec is currently undertaking a major CSG to liquefied natural gas (LNG) project that will supply natural gas to both the domestic and international markets. The Australia Pacific LNG Project involves developing CSG fields in the Surat and Bowen Basins, construction of a 520 km pipeline and a new LNG facility on Curtis Island, off shore from Gladstone.

CSG is a cleaner and greener alternative to many currently used fossil fuels, such as coal and petroleum. Power stations fired by CSG emit around half the greenhouse gases of coal-fired electricity generation and use only a fraction of the water. CSG is emerging as a preferred transition energy source as the world develops its renewable energy capacity. The CSG industry is set to provide Queensland and Australia with huge economic benefits.

Coal seam gas production relies on the extraction of groundwater in coal seams to depressurise the coal measures allowing natural gas to flow and to be extracted. This water, referred to as CSG water or associated water, is unavoidably removed in the gas production process. Removal of the CSG water is essential in order to access the vast gas resources that lie within the Surat and Bowen Basins in central and western Queensland.

Water is a vital resource and the responsible management of CSG water is crucial to Australia Pacific LNG's business. Finding appropriate and beneficial uses for this associated water is a key focus of the industry.

Making the best use of CSG water

The Australia Pacific LNG Project is being developed in a sustainable manner. Negative impacts on the environment will be minimised and any environmental benefits associated with CSG production activities will be maximised.

Australia Pacific LNG understands the importance of water for all communities and the environment. It is committed to finding appropriate and beneficial uses for all associated water produced





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by its CSG operations. Significant investment has been made to ensure that associated water can be treated to a high standard, maximising the potential options for beneficial use.

Australia Pacific LNG will continue to consult with local communities and government to determine the preferred uses for associated water in their regions.

Any proposed uses for CSG water must be approved by the Department of Environment and Resource Management. The State Government's Category 1 preferred water management options are:

- Injection of water into aquifers where detrimental impacts are unlikely
- Using untreated water where detrimental impacts are unlikely
- Treating water to an agreed standard for agricultural, industrial and potable uses

The issues around the management and distribution of CSG water are complex. There is no one-size-fits-all solution. The considered management of CSG water will include a combination of options for water allocation, taking into account important factors such as the environment, other water users, public health and safety, logistics of water distribution and government regulations. The careful balancing of these sometimes opposing considerations is necessary to determine the most desirable outcomes.

Australia Pacific LNG will implement a combination of the following water management options:

- Injection into suitable aquifers (the feasibility of this is currently being investigated and tested)
- Provision of water for existing agricultural and industrial uses, potentially reducing demand on other groundwater and surface water resources
- Reuse of water in Australia Pacific LNG Project construction and operations
- Irrigation of Australia Pacific LNG crops, and
- Supplementing environmental flows in local watercourses

Injection of water into aquifers

Injecting CSG water into aquifers involves pumping the water removed during CSG production into underground water



Installation of a trial aquifer reinjection bore

aquifers. This water could be treated by desalination or filtration, or a combination of both, provided it is of equivalent or better quality than the groundwater in the target aquifer.

Injection could be used to top up aquifers, and potentially offset the groundwater level declines in some areas that have occurred over the last 100 years.

Australia Pacific LNG is currently undertaking several injection trials in various aquifers.

Aquifer injection is not a simple process. It involves pumping water into rock formations underground and is not as easy as using a hose to fill up a swimming pool or pumping water down a well. There are a number of factors that need to be taken into consideration such as aquifer permeability, aquifer pressure levels, existing water quality and chemical makeup, mineralogy of receiving aquifers, removal of oxygen from the water prior to injection and the capacity of each injection well. Australia Pacific LNG is carefully monitoring and managing these factors throughout the trials.

If the current trials prove successful aquifer injection may commence in some areas in 2014.

Australia Pacific LNG irrigation projects

One of the highest value uses of water is to irrigate crops that will feed and benefit the local community. Australia Pacific LNG has committed to using some of its associated water in this way.

Two separate irrigation projects to be fed by treated CSG water have been established. One property is a 300 ha site near the Spring Gully water treatment facility, north-east of Roma.

A pongamia plantation has been established on this site. Pongamia is a sustainable crop where every part of the plant, down to the last leaf, can be utilised. The pongamia seed is used in the production of a bio-diesel and the stalks and leaves can be used for farm fodder. (The pongamia plantation is pictured on the front page of this fact sheet).

A second irrigation site is near the Talinga water treatment facility, south-west of Chinchilla. This 1100 ha property is destined to produce broad acre crops such as sorghum, chickpea and lucerne (approximately 530 ha to be irrigated). These crops will mainly be used for animal feed.

Australia Pacific LNG's irrigation projects will provide benefits to the community by employing local farm managers and staff, engaging contractors that live in the community and sourcing farming inputs locally, benefitting local suppliers.

The products harvested on Australia Pacific LNG's properties will increase the amount of reliable grain and fodder supplies available to local feedlots. Production will continue even in times of drought, providing economic activity in the community in traditionally slower periods.

Providing CSG water to other stakeholders

Australia Pacific LNG is currently working with landholders and the Queensland Government to address the various issues associated with the provision of treated CSG water to farmers, irrigators and industry.

Supplying water to other stakeholders is a complex issue. There are a number of considerations including:

- how the water will be delivered
- how much water supply can be guaranteed
- how much demand can be guaranteed
- how can seasonal demand be managed, and
- how can the variability and decline of CSG water production over time be managed.

Australia Pacific LNG is not willing to enter into contracts for water supply that could potentially disadvantage either party at any time and is also not willing to provide water for unsustainable short or long term activities.

Australia Pacific LNG is working very hard to balance the needs and wants of all parties in the distribution of the Project's CSG water.



Some of the treated CSG water is used to supplement flows in the Condamine River

Supplementing environmental flows

Another way that Australia Pacific LNG is currently managing CSG water is by releasing some of the water from the Talinga water treatment facility into the Condamine River.

Increasing the amount of water available in the Condamine River helps to secure water supplies in the region. It increases the opportunity for adjoining landholders to access their allocations, increases the amount of water available for communities that use river water for urban supply and can also provide environmental benefits by returning the river closer to a pre-development flow regime.

Improved river flows increase the habitat for organisms that feed native fish and turtle populations.





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CSG water is purified at our water treatment facilities

Treatment of CSG water

The water that is extracted in CSG production is generally brackish (slightly to moderately salty) and needs to be treated in order to be suitable for many uses. When treating CSG water for discharge, Australia Pacific LNG is committed to meeting Australian Drinking Water Guidelines.

Almost \$100 million has already been invested in state-of-the-art reverse osmosis (RO) treatment facilities at Spring Gully and Talinga. The Spring Gully plant was the first of its kind to be integrated in the CSG production process in Australia. There are plans for the construction of several additional RO plants across the Project area.

Reverse Osmosis is a process that pushes water at high pressure through very fine membranes. The membranes essentially capture salt and impurities on one side and allow clean water to pass through. Currently more than 90% of the water treated by the RO facilities becomes clean, usable water. With improvements in technology it is anticipated that the recovery rate could rise to 97.5% in the next few years.

The remainder of the water is a highly concentrated brine solution (very salty water). Preventing this brine or associated salt from contaminating the environment is an important element of CSG production operations.

Brine is currently contained in fully lined brine ponds. This brine can be crystallised then completely enclosed and disposed of in landfill. However, Australia Pacific LNG is committed to continuously improving its processes and is investigating the potential of the commercial sale of the produced salts and the reinjection of the saline solution into very deep, isolated geological reservoirs that are not used as water supply aquifers.

Summary

- Australia Pacific LNG will continue to consult with local communities to determine the preferred uses for associated water in the region. The community can provide valuable input to both CSG producers and government on how to make best use of additional water in their area.
- The issues around the management and distribution of CSG water are complex. Careful balancing of sometimes opposing considerations such as the environment, other water users, public health and safety, logistics of water distribution and government regulations is necessary to determine the most desirable outcomes.
- Aquifer injection is a preferred water use option but it is not a simple process. There are a number of factors that need to be taken into consideration such as aquifer permeability, aquifer pressure levels, existing water quality and chemical makeup, mineralogy of receiving aquifers, removal of oxygen from the water prior to injection and the capacity of each injection well.
- One of the highest value uses of water is to irrigate crops that will benefit the local community and economy. Australia Pacific LNG is committed to using some of its associated water in this way
- The water that is extracted in CSG production is generally brackish (slightly to moderately salty) and needs to be treated in order to be suitable for many uses. When treating CSG water for discharge, Australia Pacific LNG is committed to meeting Australian Drinking Water Guidelines.

Got a question about Australia Pacific LNG?

For enquiries about the gas fields or pipeline call 1800 526 369 or email contact@aplng.com.au

For enquiries about the Gladstone operations and LNG facility call 1300 776 205 or email aplng.gladstone@conocophillips.com

Or visit our website at www.aplng.com.au