



# **EDO-NQ FACTSHEET SERIES**

## **COAL SEAM GAS PRODUCTION AND REGULATION:**

### **WHAT YOU SHOULD KNOW**

# **COAL SEAM GAS PRODUCTION & REGULATION: WHAT YOU SHOULD KNOW**

***This factsheet is intended as a plain English guide to a particular area of law. Whilst all care has been taken in its preparation, it is not a substitute for legal advice as legal details have been omitted to provide a brief overview of this area of the law. If you require legal advice relating to your particular circumstances you should contact the EDO or your solicitor.***

## **WHAT IS COAL SEAM GAS AND HOW IS IT PRODUCED?**

### **COAL SEAM GAS**

Coal Seam Gas (CSG) is a form of natural gas (predominantly methane) bonded to underground coal beds. CSG can be extracted and burned for energy recovery like other fossil fuels.

### **HYDRAULIC FRACTURING**

Hydraulic fracturing, otherwise known as "fracking", is a process that is utilised for extracting natural gas - including CSG - from underground rock formations. Natural gas deposits produced via fracking are commonly referred to by industry as "nonconventional deposits" (deposits that tend to occur over large geographic areas), in contrast to "conventional deposits" that are localized accumulations that occur in relatively shallow, highly porous rock formations and are relatively easy to extract.<sup>1</sup>

Fracking involves injecting large volumes of water, sand and chemicals into rock formations - in the case of CSG - coal seams, in order to create a small earthquake fracturing the rock around the well, freeing natural gas trapped within the rock to flow into production wells. The gas trapped inside is released and makes its way to the surface along with about half of the "fracking fluid," plus dirt and rock that are occasionally radioactive. The returned fracking fluid is trucked off or otherwise disposed of but the other half of the fracking fluid remains deep underground - and no one really knows what happens to it.<sup>2</sup>

While chemicals added to fracking solutions are typically a small percentage - by weight (in the US, water and sand purportedly make up over 95% of the "typical solution" employed in the fracking process) - the total amount of chemicals injected into the rock is nonetheless significant.<sup>3</sup>

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<sup>1</sup> Lisa Sumi, "Oil and Gas At Your Door: A Landowner's Guide to Oil and Gas Development", Oil & Gas Accountability Project, p 1-3 (2d Edition, 2005), available at <http://www.earthworksaction.org/LOGuidechapters.cfm>.

<sup>2</sup> Christopher Bateman, "A Colossal Fracking Mess," Vanity Fair (June 21, 2010) available at <http://www.vanityfair.com/business/features/2010/06/fracking-in-pennsylvania-201006?currentPage=all>.

<sup>3</sup> Robert Myers, "Environmental Dangers of Hydro-Fracturing the Marcellus Shale (Lock Haven University), available at <http://www.lhup.edu/rmyers3/marcellus.htm>.

In the US, approximately 20 tons of chemicals are added to each million gallons of water and the typical fracking job involves 4-7 million gallons of water<sup>4</sup> - thus 80 to 140 tons of chemicals are involved in a typical fracking process.

## **WHAT ARE SOME OF THE RISKS ASSOCIATED WITH FRACKING AND CSG PRODUCTION?**

### **CONTAMINATION OF SURFACE AND GROUND WATER**

An obvious risk associated with the use of fracking to produce CSG is contamination of both surface and ground water by chemicals contained in the fracking solution utilised in the production process, as well as potential contamination by chemicals contained in the underlying rock formations as well.

Fracking draws up large volumes of "produced water" - put another way, "what goes down, must come up".

"Produced water" will contain not only many of the chemicals used in the original fracking solution, but also chemicals originally trapped underground and liberated when the rock is fractured. Moreover, the chemical processes that occur underground may result in the creation of new compounds through admixture of chemicals in the fracking solution with naturally-occurring chemicals in the rock.

Natural gas used by consumers is composed almost entirely (70-90%) of methane but when produced is a mixture of gases and other substances, including the hydrocarbons ethane, propane and butane as significant components (up to 20%) which are often separated at processing facilities. Other substances may be present in raw natural gas such as water vapor, sand, oxygen, carbon dioxide, nitrogen, hydrogen sulfide, and rare gases (e.g., helium, neon).<sup>5</sup>

In addition, other chemicals (typically referred to as condensate) composed of pentanes and higher hydrocarbons (e.g., hexanes, heptanes and octanes) and small amounts of the lighter hydrocarbons (e.g., ethane, propane, butane), as well as aromatic hydrocarbons (e.g., benzene, toluene, ethylbenzene and xylene), and hydrogen sulfide may be produced at natural gas wells.<sup>6</sup>

Hydrogen sulfide (H<sub>2</sub>S), which is toxic and potentially fatal at certain concentrations, bears special mention in connection with CSG production. Natural gas containing high concentrations of H<sub>2</sub>S is typically referred to as "sour gas" and may be associated with coalbed methane (i.e., CSG) extraction. If H<sub>2</sub>S dissolves in water - and fracking uses a lot of water - it forms a mild acid that can corrode pipes, valves, meters and other gas handling equipment. In the US, H<sub>2</sub>S has been the subject of numerous complaints regarding water well contamination and migration into homes following coalbed methane development.<sup>7</sup>

There is clearly potential for produced water to leak from wells into ground water. A common problem in the US has been methane migration due to defective well casing.

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<sup>4</sup> Ibid.

<sup>5</sup> Sumi, Ibid at I-2.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid at I-3.

There also is clearly potential for produced water to seep from fractured rock formations into ground water. According to the Pittsburgh Geological Society's article "Natural Gas Migration Problems in Western Pennsylvania", methane migration occurs when natural gas escapes "from the reservoir rock, coal seam, pipeline, gas well, or landfill. If the gas migrates through the bedrock and soil, it can result in an explosion capable of damaging property and causing loss of life".<sup>8</sup>

Another obvious problem associated with natural gas production via fracking is the discharge of produced water to surface waters as the result of spills, accidents or (unfortunately) intentional releases. Such discharges may occur at well heads, collection ponds, pipelines, or other production facilities.

## IMPACTS ON WATER QUANTITY

Given the location and nature of CSG production via hydraulic fracturing, there is also a significant potential that ground water quantity may be impacted as well, as water contained in underground aquifers is drawn up as well.

## AIR POLLUTION

Aside from air pollution associated with venting or flaring methane produced from development wells, CSG production is likely to contribute relatively significant levels of methane (CH<sub>4</sub>) - a potent greenhouse gas (GHG) - to the atmosphere.

According to a recent study by the US Environmental Protection Agency, the natural gas industry in the US emitted the equivalent of 261 million metric tons of worth of CO<sub>2</sub> equivalents in the form of methane gas in 2006. This means that roughly 3.25% of methane produced by natural gas wells in the US leaked into the atmosphere - much higher than the "fraction of 1%" previously claimed by industry.<sup>9</sup>

## HEALTH RISKS

In the US, the natural gas industry has used a number of known chemicals in fracking solutions - including benzene, ethylbenzene, toluene, boric acid, monoethanolamine, xylene, diesel-range organics, methanol, formaldehyde, hydrochloric acid, ammonium bisulfite, 2-butoxyethanol, and 5-chloro-2-methyl-4-isothiazotin-3-one. At least half of these are toxic - many are carcinogens, neurotoxins, endocrine disruptors, and mutagens. However, it is estimated that a third of the chemicals in fracking fluid remain unknown to the public.<sup>10</sup>

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<sup>8</sup> Available at <http://www.pittsburghgeologicalsociety.org/naturalgas.pdf>. For a discussion of examples of hazardous incidents involving methane migration, see Myers, *ibid*.

<sup>9</sup> See Dr Robert Howarth, "EPA confirms high Natural Gas leakage rates", available at <http://theenergycollective.com/index.php?q=david-lewis/48209/epa-confirms-high-natural-gas-leakage-rates>; see also "Greenhouse Gas Emissions Reporting from the Petroleum and Natural Gas Industry: Background Technical Support Document", USEPA Climate Change Division, available at [http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W\\_TSD.pdf](http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf).

<sup>10</sup> Christopher Bateman, *ibid* (quoting Theo Colburn).

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## OTHER ENVIRONMENTAL IMPACTS

It goes without saying that there are many other environmental impacts associated with the infrastructure and effort that accompanies natural gas production - especially where that production employs hydraulic fracturing. Significant infrastructure production, transportation and treatment facilities must be built and maintained on land where CSG is being produced (e.g., access roads, wellheads, pipelines, treatment ponds). These activities necessarily result in increased noise, dust, and traffic for landowners.

## WHERE IS CSG PRODUCTION UNDERWAY OR PROPOSED?

In Queensland, CSG development and production is currently underway across the Surat and Galilee Basins, with about 3,500 wells currently built and as many as 40,000 planned.

The Queensland and/or Federal governments have approved a number of large-scale natural gas production projects, including the massive, \$35 billion Australia Pacific Liquefied Natural Gas (APLNG) project, approved by the state on 9 November 2010 and now awaiting federal approval under the *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). The APLNG project follows federal and state approval of Santos' Gladstone LNG project and BG Group's \$15 billion Curtis Island LNG project late in 2010.

Queensland has a majority of Australia's CSG deposits, and while the bulk of those deposits are located in the southern part of the state, CSG deposits - and infrastructure associated with production of those deposits - can also be expected to be developed in northern portions of the state as well.

Make no mistake: The coal seam gas industry is coming to you in the next couple of years.

## HOW IS CSG PRODUCTION REGULATED IN QUEENSLAND?

Currently CSG production is regulated mainly by the states in Australia, with limited review by the Federal government if the provisions of the EPBC Act are triggered.

## QUEENSLAND REGULATION

It is fair to characterise state regulation of CSG production and its effects as being in a state of flux, with a number of legislative and regulatory responses having been undertaken only within the past year.

Until relatively recently, extraction of CSG was regulated primarily under the *Petroleum and Gas (Production and Safety) Act 2004 (Qld)* (P&G Act) and *Environmental Protection Act 1994 (Qld)* (EP Act). In addition, CSG production could also be made subject to review and approval under the *State Development and Public Works Organisation Act 1974 (Qld)* if the project is declared to be a "significant project" by the State Coordinator General (and many CSG projects are likely to be so designated given their scale and impact, capital investment, employment levels and revenue generation potential).

Recently, the Queensland Parliament has enacted a series of legislative amendments to address CSG production. These enactments amend a number of existing statutes, as follows:

- The *South-East Queensland Water (Distribution and Retail Restructuring) and Other Legislation Amendment Act 2010 (Qld)* made a series of amendments to the *Environment Protection Act 1994 (Qld)* (EP Act) to regulate CSG water. The amendments, which took effect in July 2010, require level 1 environmental authority applications (and amendment applications) for CSG activities to be accompanied by an Environmental Management (EM) plan which addresses prescribed issues in respect of CSG water. A temporary prohibition on the construction of evaporation dams for CSG water is also in place.
  
- The *Natural Resources and Other Legislation Amendment Bill 2010 (Qld)* (introduced 5 October 2010) proposes to further amend the EP Act to introduce a new section 312W that would prohibit the use of restricted fluids in the fracking process for various activities, including CSG projects. Restricted fluids include petroleum hydrocarbons containing benzene. The Bill also proposes to introduce require a project proponent to alert the administering authority in the event that it becomes aware that its activities have negatively affected, or are likely to negatively affect, the water quality of an aquifer.
  
- Passage of the *Water and Other Legislation Amendment Bill 2010 (Qld)* in December 2010, attempts to improve the management of impacts arising from the extraction of underground water from petroleum activities, including CSG activities, by among other things:
  - transferring the regulatory framework for underground water from the Petroleum Act 1923 (Qld) to the *Water Act 2000 (Qld)*, and amending the 2000 statute to include an underground water management regime to manage impacts arising from the extraction of underground water associated with all petroleum activities, including CSG activities;
  - setting trigger thresholds for obligations to "make good" impacts on water bores (being a 5m drop for consolidated aquifers and a 2m drop for shallow alluvial aquifers);
  - providing bore owners with the opportunity to ask CSG producers to investigate water bore drops and supply reductions;
  - where caused by CSG operations, requiring the CSG producer to negotiate "make good" arrangements with the bore owner (such as deepening the bore or arranging an alternate supply);
  - expanding the role of the Queensland Water Commission to include overseeing underground water monitoring and reporting of cumulative underground water impacts;
  - providing for emergency directions powers to address impaired supply of water supply bores; and
  - amending the *Water Supply (Safety and Rehabilitation) Act 2008 (Qld)* to address CSG water impacting on drinking water supplies by regulating produced water under the existing recycled water regulatory framework in that statute.

## REGULATION UNDER THE P&G ACT AND EP ACT

Proponents of a CSG production activity must apply for and obtain a "resource authority" under the P&G Act, as well as an "environmental authority" - which sets forth environmental conditions applicable to the activity - under the EP Act. Applications for an environmental authority are submitted to, and decided by, the Department of Environment and Resource Management (DERM).

Under the EP Act, the public has a right to make a submission in response to an application for approval of a "Level 1 Petroleum Activity" - a term that generally speaking includes CSG production projects. In limited circumstances, public notification (and submission rights) may apply for amendments to an approved Level 1 Petroleum Activity.

The time frame for public response to noticed applications for Level 1 petroleum activities is extremely short - submissions must be made within 8 business days after publication of the notice (unless a later date is fixed by the state authorities). There are a number of formal requirements for a properly made submission - namely, the submission must (1) be in writing, (2) be signed by or for each person making the submission, (3) provide the name and address of each signatory, (4) be submitted to DERM, and (5) be received by DERM by the last day of the submission period.

Under the EP Act, DERM may decide whether to require an Environmental Impact Statement (EIS) to be prepared by the development's proponent - an EIS is not automatically required. If DERM decides to require an EIS, then it will issue public notice soliciting comment on both the terms of reference for preparation of an EIS (i.e., the issues that must be considered), as well as a second notice soliciting comment on the EIS itself.

In March 2010, DERM introduced its Coal Seam Gas Water Management Policy, which: (1) requires producers to prepare an environmental management (EM) plan for coal seam gas activities, (2) establishes model conditions for CSG activities, and (3) approves CSG water for beneficial use.

If DERM approves a proposal under the EP Act, you can obtain - for a fee - a copy of the final Environmental Authority showing the conditions and all relevant plans and maps documents from the agency, as well as environmental protection orders, monitoring reports, environmental reports and other information under the public register held under s540 of the EP Act.

The public also may go to the Planning and Environment Court to seek an order to remedy or restrain a breach of the EP Act for example, breach of conditions contained in a CSG project's Environmental Authority or other violation of statute.

## REGULATION UNDER THE STATE DEVELOPMENT AND PUBLIC WORKS ACT

If a CSG project has been declared a "significant project" under this statute, then concerned citizens must make sure they provide input into the terms of reference and EIS for that project, since the Coordinator General, not DERM, is the most important decider of conditions for the environmental authority. If a CSG project is declared a "significant project," then an EIS (and preliminary terms of reference) will be undertaken, giving the public similar opportunities - albeit limited - to comment.

## FEDERAL REGULATION

The EPBC Act provides for review by the Federal government of any proposal that is considered a "controlled action". A "controlled action" is any action that has, will have or is likely to have a significant impact on:

- a matter of "National Environmental Significance" ("MNES");
- the environment anywhere if the action is taken on Commonwealth land;
- the environment on Commonwealth land if the action is taken outside Commonwealth land; or

- any environment (whether inside or outside Australia) if the action is taken by the Commonwealth.

Under the EPBC Act, the Federal environment minister can reject a proposed action if it will have unacceptable impacts on a MNES or on the environment on Commonwealth land, or alternatively, can impose additional conditions on the action to minimise impacts - as was done for BG International's Curtis LNG project.

## **IS CURRENT REGULATION ADEQUATE?**

This, of course, is the \$64,000 question.

The recent legislative initiatives of the Queensland parliament, as well as regulatory initiatives undertaken by the state and federal governments, are undoubtedly steps in the right direction. But they are not likely to - in themselves - be sufficient to address the numerous risks associated with CSG development, or to adequately account for the uncertainties and unknowns associated with this relatively new industry.

## **WHAT YOU CAN DO?**

### **GET INFORMED**

There are many groups - in Australia, the US and elsewhere that have formed to inform the public regarding the risks of fracking to produce natural gas, most of which have websites that provide links to scientific and other data.

In Australia, the following websites are a good source of information and activism:

<http://lockthegate.org.au/>

[http://www.agforceqld.org.au/index.php?tgtPage=&page\\_id=260](http://www.agforceqld.org.au/index.php?tgtPage=&page_id=260)

<http://www.sixdegrees.org.au/>

In the US, here are some public interest groups' websites dedicated to fracking issues:

<http://www.nyh2o.org/#main/home>

<http://www.catskillmountainkeeper.org/>

<http://www.damascuscitizens.org/>

Good overview document <http://www.earthworksaction.org/LOguidechapters.cfm>

### **STAY INFORMED**

Stay up-to-date on proposed CSG development in your region or local area, as well as state and federal government actions to deal with CSG development.

## Communicate With Government Officials

Sign the petition supporting a Ban on Coal Seam Gas industry development

[http://www.parliament.qld.gov.au/view/EPetitions\\_QLD/CurrentEPetition.aspx?PetNum=1592&IInd ex=-1](http://www.parliament.qld.gov.au/view/EPetitions_QLD/CurrentEPetition.aspx?PetNum=1592&IInd ex=-1)

Sign the Petition Supporting a Moratorium On Fracking

Join Activist Groups

### **MORE INFORMATION FROM EDO-NQ**

A more detailed "CSG factsheet" will be available on EDO-NQ's website - [www.edo.org.au/edonq](http://www.edo.org.au/edonq) - and will be updated as more information and analysis of CSG development and regulation becomes available.

If you have any further questions or concerns about any of these matters, then please contact us on the details below. While we have limited resources, often we can give you quick advice over the phone or direct you to someone who may help on a free or reduced rate basis.

**Stay in contact with your local Environmental Defenders Office.**

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