SENATE REFERNCES COMMITTEE ON RURAL AFFAIRS & TRANSPORT

INDEX OF TABLED DOCUMENTS

Inquiry into the management of the Murray Darling Basin Impacts of mining Coal Seam Gas

CANBERRA, ACT – TUESDAY, 9 SEPTEMBER 2011

LODGED BY	TITLE/SUBJECT	PAGES
Doctors for the Environment	Additional information;	5
National Toxics Network	Additional information; National Toxics Network, *Hydraulic Fracturing in Coals Seam Gas Mining: The Risks to Our Health, Communities, Environment and Climate r*eport, 2011. (See attached link) http://ntn.org.au/wp-content/uploads/2011/07/NTN-CSG-Report-July-2011.pdf	7 36
National Industrial Chemicals Notification & Assessment Scheme (NICNAS)	*Outline of industrial regulatory framework* chart;	1
NSW Government Department of Trade & Investment, Regional Infrastructure & Services	*NSW Government Statement*;	6

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Doctors for the Environment Australia additional material for tabling at the Senate hearing in relation of our submission to the Senate

We contend that the State and Commonwealth public health processes presently used to protect the public in coal seam gas mining have been inadequate. As detailed in our submission we commend a national independent Health Impact Assessment process. Lessons can be learned from the deficiencies in the health assessments of coal mining.

The Commonwealth involvement in the process

1. NICNAS for the assessment of chemicals.

Contracts worth billions of dollars were signed and mining commenced with the use of chemicals which had not been assessed yet approvals were given. This is confirmed by correspondence below. Some of these chemicals may be carcinogens under certain circumstances.

Doctors for the Environment Australia (DEA) wrote to the Minister of Health and Ageing on 11 May expressing concerns relating to the health impacts of coal seam gas (CSG) developments. On the 5 August the response from the Hon Catherine King, Parliamentary Secretary for Health and Ageing, said

... If the NICNAS risk assessment identifies adverse health and/or environmental effects, additional controls are recommended to agencies with risk management responsibility for worker safely, public health and environmental risks arising for chemicals.

Many chemicals on the AICS (Australian Inventory of Chemical Substances) have not yet been assessed for health and environmental safety and these were 'grandfathered' to the chemical inventory when NICNAS was established. The chemicals used in fracking are listed on the inventory, however, the majority of these chemicals have not been assessed by NICNAS

2. The Department of the Environment is involved in the process through the EPBC Act. Their assessment of environmental water issues has been extensive but there is no health input to these deliberations. We have had correspondence with the Environmental Assessment Branch.

In response to a letter from DEA, James Barker, Assistant Acting Secretary, Environmental Assessment Branch, states on 8 August,

matters relating to the regulation of coal mining and the coal seam gas industry more generally, including health issues, are the responsibility of state and federal governments

Coal seam gas proposals that have been approved under the EPBC Act are subject to detailed conditions to minimise or avoid impacts on nationally protected matters. For example strict conditions have been imposed which require the companies to meet water treatment standards, implement appropriate flow regimes and develop management and monitoring plans. The Australian Government will ensure these conditions are implemented so that long term protections remain in place.

However it is apparent that not all developments have been assessed by the Commonwealth

TONY BURKE: What we've done is we've made sure that the impacts have proper safeguards and protections around them. One of the things that I put in place for the approvals that I've dealt with - and mind you, not all of these projects come for Commonwealth approval - but for the ones that have come to me, we've made sure that we've got the scientific oversight happening and that we're testing one aquifer at a time to make sure that as these projects go ahead, we're constantly monitoring and making sure we don't get detrimental impacts on the environment.

http://www.abc.net.au/lateline/content/2011/s3305181.htm
29.8.2011

Therefore Doctors for the Environment Australia considers the protection of public health displayed by the Commonwealth to be inadequate in relation to water and chemical issues. We base this view on the correspondence we have tabled and which we have received since we made our submission.

The State Processes

The states of Queensland and New South Wales

As detailed in the DEA submission, the responsibility for health impact assessment was historically devolved to states and it is therefore important to ask if the potential impacts detailed in the DEA submission were assessed, when in relation to the approvals given and by whom. Will these assessments be made available so that the medical profession and the public can be assured that health is protected? This information is not available.

In both states coal seam gas mining has proceeded without adequate consideration of heath impacts as evidenced by the belated commissioning of water research, the belated exclusion of prime agricultural land and banning of fracking chemicals after they had been used in Queensland, and the calling of an Inquiry in NSW which embraces health impacts. All these events have occurred since we made our submission.

In relation to the role of the states we are left asking what hope is there that the potential health impacts of CSG will be addressed properly by the states when they have addressed the known health impacts of coal mining so poorly over several decades. Coal and CSG mining present to the public health physician similar complex problems with impacts on communities, food production, water and the atmosphere.

Account of the mental health impacts of CSG mining:

Dr Steve Robinson reports

Exploration is when the psychological stresses are first noticed in the community. Exploration maps are placed in the local newspaper but they are difficult to decipher and individual landholders are not notified. This uncertainty starts to generate community anxiety. Some individual landholders are approached and offers are made mostly for access but with agreements that include confidentiality clauses. Individuals don't know if they are being treated fairly.

The community starts to divide between the few who see it as an opportunity for an additional income and the larger number who hear the risks and see little in the way of benefits. The local council has a sharp pro-mining v anti-mining divide leading to a spill of one mayor. The letters page in the local newspaper has amply echoed this divide for the past 5 years.

Seismic surveys come and go with some damage to paddocks, heavy vehicle traffic ruining country roads and noise. Drilling occurs with the same complications. The town takes on a different look with mining vehicles being prominent and drilling teams from interstate coming and going. The visual impact is slowly increasing.

A few properties are purchased for good prices, other houses close-by cannot be sold and their value drops. Lifetime plans are put on hold or cancelled. Property development in the area declines as a result of the general uncertainty. Rental property is more expensive. The tourism industry is threatened and wealthy prospective city retirees look to other beautiful areas not impacted by mining. The gas company employs very few locals.

Exploration wells are fracked to optimize the flow and the wells are flared for months. There is no explanation of the risks and precautions taken in these fracking and flaring operations. There is no publicity given to any air or water

testing. There have been at least two separate unpredicted explosions locally due to gas migration known to the community from just a dozen exploration wells and even more dramatic events elsewhere from gas mining. This results in understandable anxiety about safety risks. In Gloucester this first phase has taken 5 years so far and production has yet to commence.

Glen Albrecht and co-investigators described a type of grieving for a lost, loved landscape. He labelled this Solastalgia. The Gloucester Valley is a heritage and very beautiful landscape, which has drawn tourists and retirees to the valley in large numbers. The long time residents have a particularly strong attachment to the landscape and the potential devastation caused by 350 closely sited gas wells sows the seeds for depressive illnesses for many of the 1000 residents of the valley and the 2500 residents of Gloucester town.

What are the effects on the individual of this general stress on residents of a town and valley? Stress is cumulative and will highlight the weak link in those already at risk. Those with illnesses of depression, anxiety or paranoia that are currently under control run the risk of having those illnesses reactivated. These were the most numerous group of the disorders I saw in psychiatric practice in this newly mining community. It usually takes a more intense, life-threatening stress to cause PTSD (Post Traumatic Stress Disorder) but stresses that continue for a very long time, involving a powerful opponent and having no apparent solution promote feelings of helplessness and hopelessness. These are hallmarks of depressive illness and I saw a few such cases in individuals with no prior history of mental disorder. Other behaviours included angry outbursts, single episodes of antisocial behaviour, interpersonal disharmony, and 'locking the gate.

Dr Steve Robinson is now a retired psychiatrist who uniquely practiced for ten years prior to retirement in a farming community newly affected by mining.)

The need for national Health Impact Assessment (HIA)

The potential health impacts of CSG and the existing impacts of coal mining are complex issues requiring expertise from science and public health which should be independent from the development pressures of state governments.

Uniform health and monitoring requirements for all states for CSG should be enacted by the Commonwealth through a HIA process which should be ongoing to take into account emerging medical science.

Many of these requirements are presently not addressed such as the health impacts which occur in communities due to disruption, relocation, change of occupation as detailed in our submission.

One issue which has been excluded from EIS processes for coal and CSG mining in the states is the health impacts of green house emissions. This is an international issue and one which the Commonwealth would be wise to

consider in view of the Qantas decision. This issue should come under a national HIA process. Presently it is not considered by the states.

We hope that the Senate inquiry will make it clear to governments and industry that it is in their long term interests to reform these matters. The science of these health impacts has become secure and populations suffering needless consequences will have legal recourse. To governments we say the cost of prevention is always small compared to that of treatment. And prevention is a cost that should be paid by the polluter.

To those who are concerned about the erosion of state responsibilities, we say that it is unlikely that each state has the expertise to handle these issues competently. In a population of 20 million we need a heath impact system for complex public health issues with experts culled from around Australia.

David Shearman

7 September 2011

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Working globally for a toxic free future

Inquiry into the management of the Murray-Darling Basin
Impacts of mining coal seam gas

Hearing - Friday, 9 September 2011 -

Parliament House, CANBERRA

Presentation on behalf of National Toxics Network

Research undertaken by the National Toxics Network has identified a range of environmental health concerns related to coal seam gas activities. This has led to our call for a:

- comprehensive hazard assessment for all chemicals used in Australian CSG activities, including impacts on human health, ecotoxicology and environmental fate (air emissions; releases to groundwater and watercourses).
- comprehensive environmental health assessment of all chemical releases associated with CSG activities including gas flaring, intentional venting, fugitive emissions, diesel use, waste water management; and
- full life cycle analysis and cost-benefit to investigate the long-term impacts of the industry in terms of cleanup and remediation of contaminated areas, treatment of wastewater, groundwater impacts, increased landfill capacity to dispose of CSG waste products and accurate assessment of the industry's greenhouse gas contribution.

In late 2010, NTN reviewed a range of industry environmental assessments submitted to government agencies in support of CSG projects. We also consolidated information from the publicly available regulatory data, published reports and scientific research. The subsequent report has continued to be updated as new information became available.

This presentation focuses on chemical use (drilling and hydraulic fracturing fluids), waste management, hazardous air emissions from CSG activities, management and disposal of produced water (wastewater) and contamination of groundwater and surface water.

Chemical Use in Australian Gas Fields

From an assessment of industry documents, it is apparent that in some cases large quantities of chemical additives are used both at the drilling stage and hydraulic fracturing. A risk assessment provided to the QLD Department of Environment and Resource Management (DERM) listed approximately 18,500 kilograms of chemical additive used per well with up to 40% (7,500kg) not recovered.[1]

The chemicals used by CSG consist of surfactants, lubricants, acids, scale/corrosion inhibitors and biocides. The identity of some chemicals could not be established from their Material Safety Data Sheet (MSDS) due to 'trade secrets' protection. Of those identified using CAS[2] numbers, many had either acute or chronic toxicity warnings on the MSDS or adverse findings in the scientific literature. The vast majority of the compounds listed had only limited data on their environmental fate and toxicology. Of the 23 identified as commonly used *'fracking'* chemicals, only 2 had been assessed by the national regulator, National Industrial Chemicals Notification and Assessment Scheme (NICNAS) and neither was for their use in CSG. Australian Petroleum Production and Exploration Association (APPEA) now provide a list of approximately 46 substances but with no CAS numbers, accurate identification of the chemicals is difficult. Other industry documents identify chemicals used, which are not listed by APPEA.[3]

Chemicals used in Australia:

While industry representatives at public meetings we have attended have stated that the chemicals used are household chemicals and are 'safe', some of the products used by the Australian industry include some very toxic substances.

Ethylene Glycol, a known human respiratory toxicant and associated with increased risks of spontaneous abortion and sub-fertility in female workers;
2-Butoxyethanol, a highly mobile and persistent contaminant of groundwater, which can cause reproductive problems and birth defects in animals, and destruction of red blood cells;
Ethoxylated 4-nonylphenol, a persistent, bioaccumulative, endocrine disruptor, very toxic to aquatic organisms and causing sexual deformities in exposed oyster larvae, found to increase the incidence of breast cancer in lab animals;
Methanol, a volatile organic compound, highly toxic to humans;
Isopropanol, central nervous system depressant capable of causing degenerative changes in the brains of lab animals;
Formamide, a teratogen with the potential to affect the unborn child, which can be absorbed into the body by inhalation and through the skin;

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[1] Coal Seam Hydraulic Fracturing Fluid Risk Assessment. Response to the Coordinator-General Requirements for Coal Seam Gas Operations in the Surat and Bowen Basins, Queensland. Golder Associates 21 October 2010

[2] CAS registry numbers are unique numerical identifiers assigned by the Chemical Abstracts Service to every chemical described in the open scientific literature.

[3] Australian Petroleum Production & Exploration Association Ltd (APPEA), Chemicals that may be used in Australian fracking fluid Available at http://www.appea.com.au

Naphthalene, causes nasal and lung tumours and is listed by IARC as *possible human carcinogen'*. The US Department of Health and Humans Service found it to be *'reasonably anticipated to be a human carcinogen'*.
Acrylic Copolymers, according to Haliburton[4] acrylic polymers consists of 85% acrylonitrile, a human carcinogen. The copolymer may also contain methyl acrylate or other carcinogens such as vinyl chloride, butadiene and styrene. Acrylonitrile has been detected in US air sampling of gas sites at high levels.

There are also chemicals used by the Australian CSG industry that the State University of New York [5] have found to be 'dangerous at concentrations near or below chemical detection limits.' These include glutaraldehyde, brominated biocides (DBNPA, DBAN), propargyl alcohol, 2-butoxyethanol (2-BE) and heavy naphtha.

BTEX (benzene, toluene, ethylbenzene, xylene), chemicals may be found in drilling fluids and are also natural volatile compounds within the coal seam. BTEX are known contaminates of air, soil, groundwater and human blood, including that of children. They have serious short and long term health impacts including for benzene the link leukemia.

CSG's threat to Australia's water resources
It is not surprising that BTEX chemicals have been found in monitoring wells associated with CSG activities; most recently in five of 14 bores at Arrow Energy's gas fields, near Dalby. Benzene was detected at levels between 6 to 15 times the Australian drinking water standard (0.001 milligram per litre /1ppb).[6]

CSG activities represent a significant threat to Australia's water resources particularly, to ground water. Hydrological systems involved are complex and inadequately researched and there is a very real risk of creating connections between the coal seam and surrounding groundwater resources during the drilling and fracking process. In the Review of Environmental Factors submitted by Shenhua Watermark Coal, it was acknowledged that; *'Drill holes or fractures may intersect with one or multiple aquifers potentially mixing groundwater from different strata or altering the groundwater chemistry through exposure to the air, gas, fracking chemicals and drilling fluids or the release of natural compounds like BTEX'*.[7]

CSG activities use very large quantities of water, which not only compete with human and agricultural needs for water, which raises equity issues, but also results in large quantities of contaminated *'produced'* water. The amount of

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[4] Halliburton Patent 7799744, Polymer-Coated-Particulates, www.docstoc.com/docs/58860687/Polymer-Coated-Particulates---Patent-7799744
[5] Chemical and Biological Risk Assessment for Natural Gas Extraction in New York. Ronald E. Bishop, Ph.D., CHO, Chemistry & Biochemistry Department, State University of New York, College at Oneonta, Sustainable Otsego March 28, 2011. www.sustainableotsego.org/Risk%20Assessment%20Natural%20Gas%20Extraction-1.htm
[6] Media Release 'Arrow advises of monitoring results' 26 August 2011
[7] Shenhua Watermark Coal Pty Ltd, Review of Environmental Factors Exploration Drilling and Associated Activities -EL 7223 February 2011 GHD-RPT-EXP-DRL-007 [1] Revision 1

water extracted from a CSG well varies depending on the type and depth of the coal seam, but is reported by industry to range between 0.1 - 0.8 megalitres per day (ML/d).[8] This produced water is contaminated (as evident by community monitoring) with heavy metals (eg cadmium, barium), radioactive substances like uranium and thorium, fracking or drilling chemicals and high concentrations of salt (eg 129,300 milligrams per litre).

While the amount of salt depends on the location and age of the coal seam, it is typically between five and eight tonnes (5000kg-8000kg) for every ML of water.[9] Using the most conservative estimate, each well can produce 1 ML of produced water and 5 tonnes of salt every 10 days. As there are many wells in a gas field, the quantity of salt produced is extraordinary.

Currently produced water is managed by either re-injecting it into the well, or it is disposed of in evaporation ponds (covering many hectares), used for dust suppression on roads, or 'treated' and released into waterways, aquifers or sold on. When allowed to dry out, for example when disposed of in evaporative ponds, the dried sediment can represent an environmental health risk due to inhalation of dust containing hazardous residues such as thorium, which can cause lung cancer.

Regulation of Produced Water

Permits are provided for the release of wastewater for extended periods. In one CSG project[10] a permit was provided for 18 months at a maximum volume of 20 megalitres (ML) per day. Over 80 chemical compounds as well as radionuclides were listed in the permit and included a range of persistent, bioaccumulative toxic substances such as nonylphenols, Bisphenol A (BPA), chlorobenzenes, bromides, lead, cadmium, chromium, mercury and BTEX.

The majority of the release limits used were not based on the Australian and New Zealand Guidelines for Fresh and Marine Water [11] as many of the chemicals were either not listed in these ANZECC guidelines or were marked as having insufficient data to set water quality guidelines. The permit allowed the release of an unquantified and unassessed mixture of persistent toxic chemicals into a river used for irrigation and farming without any prior assessment of the cumulative chemical load or its possible long-term impacts on water quality, sediment, soil, stock and ecosystems.

The current regulatory proposal by the Queensland Government[12] to allow gas companies to set their own critical limits and alert levels for contaminants in recycled CSG water through a commercial risk assessment, without any public input is not acceptable.

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[8] CSG and water: quenching the industry's thirst, Gas Today Australia — May 2009

[9] Arrow Energy: Salt Management www.arrowenergy.com.au/icms_docs/95251_Salt_Management.pdf

[10] Schedule C, Australian Pacific LNG Pty Ltd Environmental Authority (petroleum activities) No. PEN100067807

[11] Available at www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality

[12] Consultation Draft ; Coal Seam Gas Recycled Water Management Plan and Validation Guideline Including Exclusion Decision Application Guideline June 2011

Definitions of acceptable risk regarding contamination are not the prerogative of a private company with commercial interests in the outcome.

Treatment of contaminated produce water using membrane filtration

The optimism of industry and regulatory agencies in regards to Reverse Osmosis membrane filtration technology to adequately treat contaminated produce water is not justified. Despite reassurances from CSG companies on this issue, the fact remains that reverse osmosis filtration has significant limitations and cannot remove all contaminants.[13] In general, if the contaminants are larger in size than water molecules, those contaminants will be filtered out. If the contaminants are smaller in size, they remain in the water. Chemicals unable to be successfully treated include bromoform, chloroform, naphthalene, nonylphenol, octylphenol, dichloroacetic acid, trichloroethylene, tris(2-chloroethyl)-phosphate. Low molecular weight, non polar, water soluble solutes such as the methanol and ethylene glycol are also poorly rejected.[14]

Air Emissions

Many of the chemicals involved in unconventional gas activities are volatile or semi-volatile. Little air monitoring appears to have been undertaken around Australian gas fields and there is limited data in the public domain. Air samples collected from around US gas operations detected 22 toxic air contaminants associated with natural gas activities. These included acrylonitrile, methylene chloride, benzene and hydrogen sulfide and resulted in air pollution with carcinogens, toxins known to damage the nervous system and respiratory irritants. The levels were between three to 3,000 times higher than levels established by public health agencies to estimate increased risk of serious health effects and cancer based on long-term exposure.

It is very difficult to estimate the chemical emissions from flaring.[15] Over 250 pollutants[16] have been identified as being released from flaring including carcinogens such as benzopyrene, benzene, carbon di-sulphide (CS2), carbonyl sulphide (COS) and toluene; metals such as mercury, arsenic and chromium; nitrogen oxides (NOx); carbon dioxide (CO2); and methane (CH4). Residents of farms south of Chinchilla QLD have already reported noxious air emissions from a neighboring gas production, complaining of burning eyes and respiratory problems. The gas company responded with the offer to install air conditioners with confidentiality agreements.[17]

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[13] www.industry.qld.gov.au/documents/LNG/csg-water-beneficial-use-approval.pdf.Also see : Stuart J. Khan Quantitative chemical exposure assessment for water recycling schemes, Waterlines Report Series No 27, March 2010 Commissioned by the National Water Commission. "The three mechanisms by which a molecule may be rejected by the reverse osmosis membrane are size exclusions (or sieving), electrostatic repulsion and hydrophobic adsorption."

[14] http://www.aquatechnology.net/reverse_osmosis.html

[15] Jiang et al., Life cycle greenhouse gas emissions of Marcellus shale gas, *Environ. Res. Lett.* 6 (2011)

[16] Canadian Public Health Association, Background to 2000 Resolution No. 3 Available at www.climatelaw.org/cases/country/nigeria/cases/casedocuments/nigeria/report/section7/doc7.1.pdf

[17] Linc site causes big 'stink' 08 Aug, 2011 11:24 AM, Queensland Country Life

Regulators in Australia are failing to adequately assess and monitor all releases from gas activities. Particular attention should be given to air emissions from condensate tanks, compressors, intentional venting, fugitive emissions (pipe leaks), evaporation ponds and methane well leaks. Air pollution associated with current natural gas activities needs continuous monitoring and the results must be fully audited and made publically available. Those facilities unable to eliminate toxic emissions should be required to cease operations.

Key findings

1. The approach to risk assessment in CSG operations on a project-by-project basis does not take into account the *cumulative impacts* on water and air quality.

2. The disposal of salt and treatment of contaminated produce water is a significant challenge in CSG operations. Limited assessment has been made of the options for treatment and capacity of wastewater facilities and landfills to manage this hazardous waste.

3. Treatment of contaminated produce water using membrane filtration has significant limitations, as it cannot remove all contaminants, particularly organic compounds with low molecular weight.

4. There is no requirement for the assessment and monitoring of the *cumulative load* of chemicals used in CSG operations, or their potential to contaminate sediment, plants, aquatic species and /or animals prior to release of contaminated produce water. A chemical-by-chemical approach to risk assessment is also in contradiction with the current *National Water Quality Management Strategy* which recommends moving away from relying solely on chemical specific water monitoring to a more integrated approach using direct toxicity assessments (toxicity bioassays which assess overall toxicity of the water) and biological monitoring to fully assess the cumulative (additive and synergistic) impacts of complex mixtures of chemicals.

5. NTN's scientific literature review of chemicals used by the CSG industry has found that only 2 out of the 23 most commonly used fracking chemicals in Australia (that we could ascertain) have been assessed by NICNAS, the federal regulator of industrial chemicals. Of the 2 assessed chemicals, neither has been specifically assessed for its use in CSG mining activities.

6. BTEX chemicals are components of the volatile compounds found naturally in the coal gas seams. The fracking process itself can release BTEX from the natural-gas reservoirs, which may allow them to disperse into the groundwater aquifers or to volatilise into air. People may be exposed to BTEX chemicals by drinking contaminated water, breathing contaminated air or from spills on their skin.

7. After hydraulic fracturing is completed, a mixture of hazardous chemical compounds remains underground. These chemicals can be distributed over time and space making them difficult and unpredictable to manage into the future, and potentially causing impacts to landscapes and future uses of the land and water.

8. The lack of disclosure on Material Safety Data Sheets of the full chemical identity of chemical ingredients used in products for CSG mining makes it impossible to realistically assess their risks and their possible impacts to the environment and human health.

9. There is an assumption that natural gas derived from CSG can act as a transition fuel because it is a 'cleaner' fossil fuel than coal however, there appears to be limited independent data on which to base this assumption. The total greenhouse gas emissions associated with CSG need to be accounted for in a thorough life cycle analysis.

10. Air pollution associated with CSG sites including emissions from well pads, compressors, gas plants, and waste sites must undergo continuous monitoring for volatile organic compounds and hydrogen sulfide. The data should be provided to regulators and be made publically available. Facilities unable to eliminate toxic emissions should be required to cease operations.

11. CSG exploration and extraction as an industrial activity with a potentially significant impact on the environment and community should require full public consultation as part of the authorisation procedure.

12. A cost/benefit analysis should be undertaken for each CSG development and include a full life cycle assessment (including greenhouse gas emission, resource consumption and cumulative impacts) to demonstrate the overall costs/benefits for the society.

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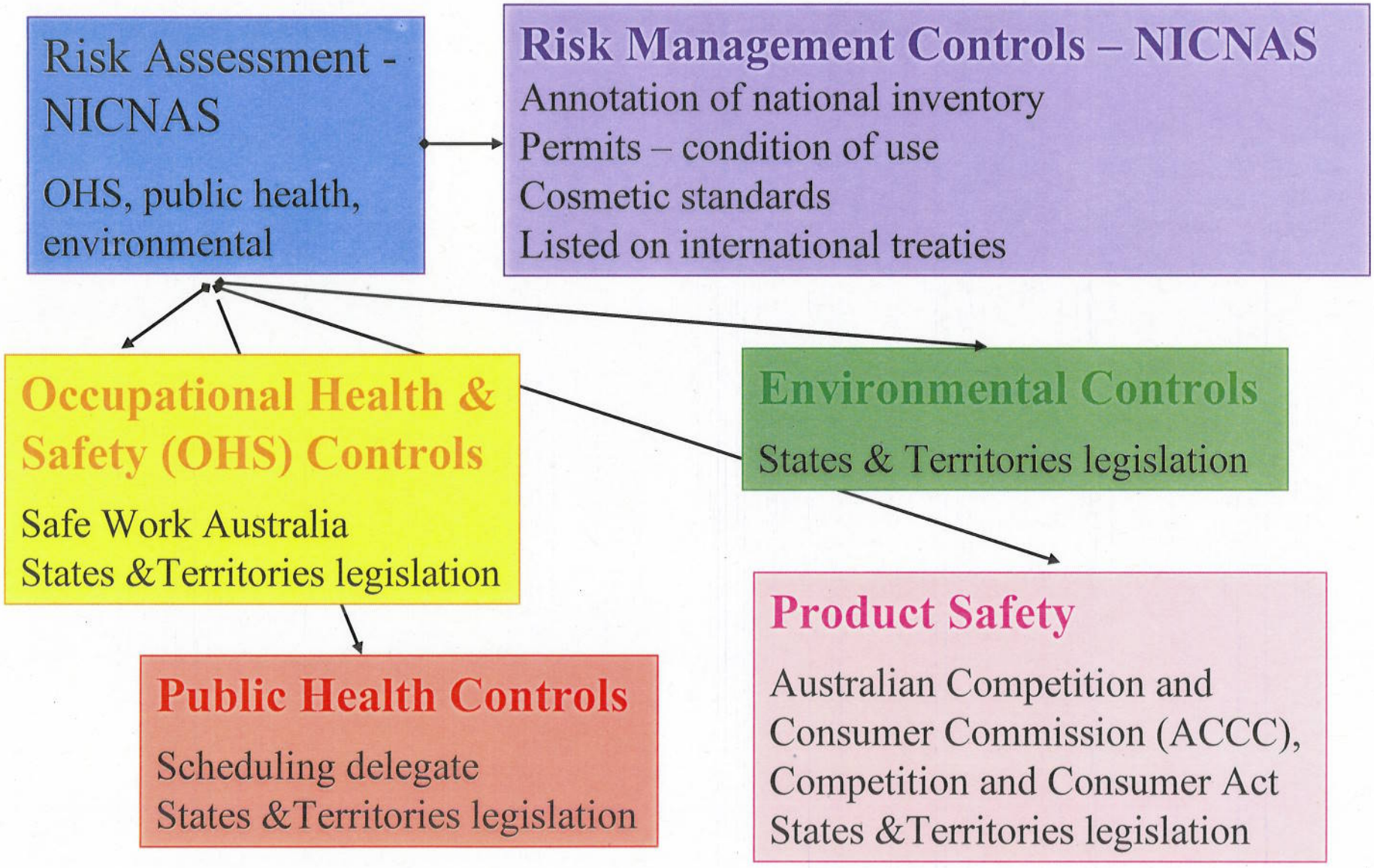
Outline of industrial regulatory framework



Senate Inquiry into the Impact of Mining Coal Seam Gas on the Management of the Murray-Darling Basin

NSW Government Statement

Agriculture and mining can and do successfully co-exist within the Murray-Darling Basin. This must continue to be the case. These two vital primary industries underpin our modern way of life and together provide enormous benefits in terms of both the creation of regional wealth and employment, and their contribution to the NSW and national economies.

The focus of Australian governments must, therefore, be on working to ensure that we make the best use of both sectors for the benefit of the broader community.

Gas as a community resource

Before proceeding, it is worth briefly considering the role of natural gas in our community.

The use of gas in NSW, initially for public lighting in Sydney, dates back to 1841. Over the 170 years since then, reticulated gas has come to be supplied to over one million households in NSW, or around one-third of all households. Therefore, we should not lose sight of the fact that the use of natural gas for domestic cooking, heating, hot water, sophisticated manufacturing and a wide range of other uses, is a day-to-day reality in NSW.

NSW's current dependence on coal as a primary fuel for electricity production means that the State is particularly vulnerable in respect of its ability to reduce greenhouse gas emissions while ensuring energy costs remain affordable. The development of a coal seam gas industry in the NSW has created an opportunity for a significant reduction in carbon emissions through an abundant new clean energy resource that has the potential to create thousands of regional jobs, add billions of dollars to the State economy, reduce our dependence on imported petroleum for transport and create new industries around the availability of gas as a feedstock.

In addition, the NSW Government has a clear vision of the economic future of this State that involves growing both agricultural and resources output. Increased use of natural gas, including coal seam gas, to meet an increasing proportion of future energy needs is a key component of the strategy to restart economic growth in NSW, to constrain rising energy costs and reduce the carbon load on the environment.

CSG in the Murray-Darling Basin

There is as yet no significant commercial coal seam gas production in the NSW Murray-Darling Basin catchment. However, the Gunnedah Basin is an area of active exploration for coal seam gas.

Coal seam gas exploration and production is an emerging industry in NSW. The majority of the focus for coal seam gas exploration is in the Hunter region, Gloucester Basin, Gunnedah Basin, Southern Coalfield (near Camden) and the Clarence Moreton Basin in north eastern NSW.

Currently, NSW only produces a very small percentage (approximately 6%) of its gas demands and is heavily dependent on gas supplies from interstate, primarily from South Australia and Victoria. Evidence suggests that these sources may be depleting in the foreseeable future, therefore, NSW needs to take action to maintain and increase the State's energy security.

Coexistence

Some areas of regional NSW are experiencing significant growth in mining and petroleum projects, leading to increasing resource use conflicts. For example, concerns have been raised that coal seam gas activities pose a risk to food production through impacts on surface and groundwater and competition for agricultural land.

The coal seam gas industry requires access to water and also to land for extraction, processing and gas transportation infrastructure. It thus potentially competes for these resources with other sectors, such as agriculture. There are also concerns that the drilling of wells into coal seams may affect overlying aquifers and alter groundwater hydrogeology, potentially affecting spring-fed water courses and the viability of surrounding water bores as the water table is lowered. Further concerns include:

- fraccing fluids being lost to the underground system with the potential to pollute groundwater;
- highly saline waste water contaminating underlying or overlying aquifers;
- surface disposal of saline waste water to offsite regions, with detrimental effects on surface water quality or soil condition; and
- escape of coal seam gas through uncontrolled paths, adding to carbon emissions and possibly reducing the condition of surface vegetation.

Based on these concerns, some stakeholders believe that coal seam gas and other mining activities cannot co-exist with agriculture. This is not the view of the NSW Government. The NSW Government believes that balanced co-existence of mining, including coal seam gas, and agriculture is not only possible, it is in the community's best interests, both at local levels and from a statewide perspective.

With three quarters of NSW lying within the Murray Darling Basin, it is critically important for NSW's rural communities and the State and Australian economies that the Basin be managed in a way that enhances the productive, social and environmental values of the region and, hence, that every effort is made to establish arrangements that enable the co-existence of mining and agriculture..

NSW Government response to community concerns

The NSW Government has acknowledged community concerns about coal seam gas and in addition to existing measures is implementing a suite of initiatives to improve the management of the industry through three main fronts, which include:

1. improving water management and water use conflict through an *Aquifer Interference Policy* and Regulation;
2. improving land management and reducing land use conflict through the preparation and implementation of *Agricultural Impact Statements* and *Strategic Regional Land Use Plans*; and
3. other actions specifically related to coal seam gas, such as a requirement for exploration licenses to be publicly exhibited prior to approval, review of hydraulic fracturing standards and limiting the chemicals used in the fraccing process.

The NSW Government controls coal seam gas through a regulatory framework comprising legislation, regulations, environmental planning instruments and other guidance material. The suite of measures to manage conflicts between sectors such as mining and agriculture are aimed at establishing a regulatory framework that minimises the risk of adverse development outcomes, but in so doing, also enables development to occur in a sustainable way in NSW.

Exploration for coal seam gas is regulated under the *Petroleum (Onshore) Act 1991* and is subject to approval by the Department of Trade and Investment, Regional Infrastructure and Services. The approvals process also requires an environmental assessment of impacts of exploration activity in accordance with Part 5 of the *Environmental Planning & Assessment Act 1979*. An exploration license only allows a company to undertake exploration, environmental assessments and feasibility studies.

The planning approvals system recognises that different types of coal seam gas production activities will have differing levels of environmental impact and should therefore be subject to an appropriate level of environmental impact assessment. In general, exploration activity, which does not comprise full development and is therefore limited in terms of both the scale and duration of activity, requires a lower order assessment. However, for those proposals that involve more intensive activity, such as larger-scale exploration activities or those involving petroleum production, there is a requirement for formal planning approval.

Provisions relating to the requirement for development consent for coal seam gas activity are contained in *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*. In summary:

- exploration activity does not require development consent, but may currently require approval under the *Environmental Planning & Assessment Act 1979*,

- production proposals, however, are required to obtain development consent under the Act.

Aquifer Interference Regulation
An important first step to improving the regulation of impacts associated with aquifer interference activities, such as mining and coal seam gas, was the commencement of an interim *Aquifer Interference Regulation* on 1 July 2011. Previously, all mining exploration activities were afforded an exemption from requiring a water licence. The interim Regulation now requires all exploration activities that take more than 3ML/yr to acquire a water licence.

With this new legislative framework, the water-related impacts can be fully considered during the planning assessment phase and if the project does not meet the requirements of the *Water Management Act 2000*, namely minimizing harm to groundwater dependent ecosystems and other water users, then it will not be able to obtain an aquifer interference approval.

In that regard, it is critical for NSW to better define what the requirements are for mining and coal seam gas proposals to obtain such an approval. This will be addressed through the development of an *Aquifer Interference Policy.* The Policy defines what activities require licences and approvals and which are exempt, and will ensure that water taken by certain activities that may interfere with aquifers is properly licensed and accounted for in the water budget and water sharing arrangements. Specifically, this Policy will establish rules for licensing both the volumetric water accounting of aquifer interference activities and the necessary requirements to obtain an aquifer interference approval for other impacts.

The Policy also defines what is considered a maximum acceptable level of harm for a number of potential impacts, such as water table and pressures, water quality, land subsidence and aquifer compaction. Projects will need to demonstrate that they meet these standards in order to obtain an aquifer interference approval.

The Policy will undergo a comprehensive consultation phase, is expected to be signed off by the NSW Government in early 2012 and will be given legislative effect through the commencement of a final Aquifer Interference Regulation.

Strategic Regional Land Use Plans
Strategic Regional Land Use Plans will identify geospatially the resource endowments of regions and, importantly, where mining activities are likely to be associated with higher risks to sectors such as agriculture and related communities. In these areas, more stringent assessment requirements will apply.

The development of these plans for the Upper Hunter (including Gloucester) and New England North West (including Gunnedah and Liverpool Plains) has now commenced, with the plans for Central West and the Southern Highlands scheduled to commence in 2012. Plans for other areas will be developed in subsequent years.

Agricultural Impact Statements
A significant interim requirement of the *Strategic Regional Land Use Policy* is that coal seam gas and other mining development proponents produce an *Agricultural Impact Statement.* This will remain a requirement until regional plans are in place.

These Statements will provide transparent, targeted information about the potential risks that mining activities may impose on agricultural industries and communities. Their purpose is to ensure that a focused assessment of the potential impacts of individual mining or petroleum projects on agricultural resources or agricultural industries is performed as part of the planning assessment phase.

The specific requirements for a project *Environmental Impact Statement*, including the *Agricultural Impact Statement*, will be listed in the Director General's Requirements for the project by the Department of Planning and Infrastructure.

Legal rights of property owners

I would now like to make a few remarks concerning the legal rights of property owners in NSW.

In NSW, even freehold ownership does not bestow exclusive possession to the land, as the petroleum and most minerals are not the possession of the landowner. This is also true of Crown leases, which includes a substantial proportion of the land in private hands in western NSW. The rights to petroleum are held by the Crown and the NSW Government has an obligation to ensure that these petroleum resources are effectively and responsibly explored for the potential benefit of the State.

However, the perception that coal seam gas explorers can enter people's property at will is false. This has never been the case in NSW.

As noted previously, exploration for coal seam gas is regulated under the *Petroleum (Onshore) Act 1991*. This legislation recognises the rights of landholders and has provisions to ensure landholders are not adversely impacted and are appropriately compensated for any petroleum exploration or production activities carried out on their land.

The access provisions of the Act underwent significant amendment in 2010 and the NSW Government is currently working with the NSW Farmers' Association, the NSW Minerals Council and the Australian Petroleum Production and Exploration Association to develop a standard template for access arrangements. The template is close to completion.

In cases where access arrangements cannot be agreed, there is provision for an arbitrator to be appointed. Historically, the number of arbitrator appointments has never exceeded ten per annum. Currently there are approximately 1,200 exploration licenses for minerals and petroleum (coal seam gas). Using a conservative assumption that each exploration license holder would have to negotiate access arrangements with five landholders per annum, this would equate to 6,000 such negotiations every year. With more than 99% of access arrangements being successfully negotiated without the need for arbitration, it seems reasonable to conclude that the existing access arrangements in NSW are working well.

Commercial production of coal seam gas requires a petroleum production lease issued under the *Petroleum (Onshore) Act 1991*. However, the Minister must not grant a production lease over the land unless appropriate development consent under the *Environmental Planning and Assessment Act 1979* is in force. In these

circumstances, the landholders' rights are subject to consideration and protection under both Acts.

Food production

Finally, I would like to make the point that the actions outlined above are also consistent with the NSW Government's position on food production security. The Government is well aware that global demand for low cost, safe and nutritious food is increasing, and will continue to increase in the future as both the Australian and global population grow. A sound approval process that addresses resource use conflicts and enables mining and agriculture to co-exist, will ensure that food producers have competitive access to natural resources to meet that need in an environmentally sustainable way.

ENDS