SUBMISSION TO THE

Senate Select Committee on Unconventional Gas Mining

MARCH 2016
The Australian Academy of Technology and Engineering (ATSE) welcomes the opportunity to provide evidence and advice to the Select Committee on Unconventional Gas Mining. The potential social, environmental and health risks associated with unconventional gas mining are not insignificant but can be managed responsibly by a robust legislative and regulatory framework. Both government and industry need to adopt evidence based leading practices and be conscious of the need for continuous improvement as new evidence comes to light. A national approach to the conduct of unconventional gas mining is supported by ATSE; however regulations must be able to respond to the different levels of risk in different plays. ATSE strongly supports the improvement and harmonisation of Australia’s current legislative and regulatory framework.

Background

The Australian Council of Learned Academies (ACOLA), which combines the four Learned Academies (Australian Academy of Science, Academy of Social Sciences in Australia, Australian Academy of the Humanities and the Australian Academy of Technology and Engineering), published a report in June 2013 on unconventional gas in Australia, titled: Engineering Energy: Unconventional Gas Production – a study of shale gas in Australia. ATSE provided project services on behalf of the ACOLA Secretariat and the Chair and Deputy Chair of the report were ATSE Fellows. The ACOLA Report provides information on a number of issues related to the Terms of Reference for the inquiry and it is in the above context that ATSE provides the Report.

The ACOLA Report reviewed the range of issues facing shale gas development in Australia and made 51 key findings considering the potential environmental, social and economic impacts of an Australian shale gas industry. The ACOLA Report also addressed the potential impact of hydraulic fracturing; the regulation of fracking chemicals; the use of groundwater, brackish water and produced water for fracking operations; and monitoring, governance and regulatory issues.

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1 ATSE advocates for a future in which technological sciences, engineering and innovation contribute significantly to Australia’s social, economic and environmental wellbeing. The Academy is empowered in its mission by some 800 Fellows drawn from industry, academia, research institutes and government, who represent the brightest and the best in technological sciences and engineering in Australia. The Academy provides robust, independent and trusted evidence-based advice on technological issues of national importance. ATSE fosters national and international collaboration and encourages technology transfer for economic, social and environmental benefit. www.atse.org.au


3 From this report, the Office of the Chief Scientist in consultation with relevant government departments developed a series of recommendations, which can be found here: http://www.chiefscientist.gov.au/wp-content/uploads/shalegas-recommendationsFINAL.pdf
In September 2015, ATSE hosted an International Unconventional Gas Conference and Workshop in Sydney. The Conference and associated one-day Workshop brought together a wide array of stakeholders including representatives from nine international Learned Academies. The Conference itself was well attended with over 150 delegates in attendance over the two days. The subsequent Workshop involved Academicians, invited experts and government observers. The participating Academicians considered the conclusions and observations arising from the Conference, as well as recent national unconventional gas (and oil) reviews, in reaching a number of conclusions, which were then circulated for comment before being finalised. The resultant Communiqué presents 35 key findings under eight inter-disciplinary topics: resources, economics, community concerns, groundwater, hydraulic fracturing, landscape and environment, emissions, and regulation.

To assist the Committee in its research, ATSE has also shared a summary document compiled in preparation for the Workshop. The document contains verbatim extracts from the summaries of seven international Academy reports (and selected reports by other agencies) on unconventional hydrocarbons. Although this document is shared in confidence with the Committee, all the information found in the document is publicly available and can be found in the respective source reports.

In addition to recommending the documents described above to the Committee, ATSE has prepared the following responses to the Committee’s terms of reference.

**A national approach to the conduct of unconventional gas mining in Australia (1a) and harmonisation of federal and state/territory government legislation, regulations and policies (1f)**

A national approach to unconventional gas developments in Australia should have a strong emphasis on the need for a social licence to operate. ATSE’s Unconventional Gas Workshop found that gaining community support for unconventional gas developments requires sustained engagement, recognition of prevailing community values, communication of scientific, technical and socio-economic information by trusted sources, certainty in the regulatory regime and confidence that long term socioeconomic benefits will accrue.

The ACOLA Report found that a number of the activities associated with unconventional gas exploration, development and production have the potential to have an adverse impact on the natural and the human environment and therefore it is essential that unconventional gas activities are carefully and comprehensively monitored and transparently regulated to leading practice. A national approach with inter-state consistency will help to resolve some of the challenges presented by the overlapping and regional aspects of shale gas impacts. Furthermore, committing to a nationwide set of leading practice principles that acknowledge the need for continuous improvement is necessary to help improve the unconventional gas sector’s public image and to work towards attaining a social license to operate.

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The 2015 Victorian Auditor-General’s Office report *Unconventional Gas: Managing Risks and Impacts* found that the scientific literature and reviews have concluded that risks can be managed if there is:

- comprehensive baseline data and monitoring
- appropriate siting based on sustainability principles
- implementation of best practice construction and operation standards, including well design and management
- implementation of best practice risk mitigation controls
- a strong regulatory framework
- early and risk based community engagement.

This report found that the current Victorian regulatory system did not fulfil these criteria and would not adequately manage unconventional gas risks. It made a number of recommendations addressing how the shortcomings of Victoria’s regulatory framework could be addressed. The report also noted that they were unable to find evidence that any jurisdiction had “adequately addressed all these principles to date”.

At its May 2013 meeting, the Council of Australian Governments’ (COAG) Standing Council on Energy and Resources (SCER) (predecessor to the COAG Energy Council), endorsed the National Harmonised Regulatory Framework for Natural Gas from Coal Seams. SCER agreed that the Framework should not be a static document and noted that it would be updated on a continuing basis by jurisdictions. Their latest annual implementation update was released in December 2016. It discusses the most recent developments in each state and territory and concludes that “work being undertaken by the States will likely inform an update on leading practices for regulating CSG. The Australian Government will discuss merits of updating the Framework with jurisdictions as inquiries, assessments, scientific studies and their results are being released.” ATSE suggests that this framework could be expanded to cover all unconventional gas mining activities.

**The health, social, business, agricultural, environmental, landholder and economic impacts of unconventional gas mining (1b)**

There are many processes that occur during unconventional gas mining operations which have the potential to impact the environment; however most if not all of these impacts can be managed. Nonetheless, if not adequately managed, the clearing of land to establish drill sites, levelling of the site, and establishment and construction of access roads can result in impacts on soil, increased fire risk, spread of invasive species and fragmentation of patches of native vegetation, habitats and landscape function. Other potential environmental impacts on the landscape may include impacts to surface and ground water systems, ecosystems, and induced seismicity. Research into Australia’s sedimentary basins and related water resources, landscapes and ecosystems, and how best to monitor them, will be essential to ensure careful management of gas production and minimisation (and avoidance) of potential impacts.

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Provided leading practice is followed and there is comprehensive knowledge of the subsurface, hydraulic fracturing is most unlikely to cause damaging induced seismic events or result in widespread, systemic impacts on drinking water resources. Poor well construction and improperly decommissioned wells are risks to groundwater and it is important to be able to demonstrate life-time well integrity and remediation responsibility for unconventional gas wells and adopt leading practice for waste water disposal and management of materials and chemicals.\(^7\)

The ACOLA Report noted that emissions of hydrocarbons and other atmospheric pollutants can arise from shale gas extraction. However these impacts are not exclusive to shale or any other unconventional gas production. The potential impacts of gas production on human health have received some attention overseas. There are limited overseas data suggesting some increased health risk, however the ACOLA Report noted that there were no Australian data to suggest that major health risks were likely to arise from shale gas operations here. It also noted the importance of thorough health risk assessments (particularly where gas production takes place in populated areas), together with baseline monitoring including local and regional atmospheric monitoring regimes and transparent reporting of pollutants.

The Canadian Council of Academies produced a report on the environmental impacts of Shale Gas Extraction in 2014\(^8\).

The body of scientific literature surrounding the potential environmental and health effects of unconventional gas is constantly growing and it is important to consider new evidence as it arises. Both regulators and industry have a responsibility to stay informed and improve their practices when evidence indicates it is appropriate to do so. A key finding of ATSE’s Unconventional Gas Workshop was that further research will help to improve our knowledge of unconventional gas and other resources, decrease project costs and impacts, improve regulations and the management of environmental and community impacts.

Legislative and regulatory frameworks for unconventional gas mining in comparable overseas jurisdictions (1g)

ATSE’s 2015 Workshop brought together Academicians and other expert participants from nine countries: Argentina, Canada, China, Germany, South Africa, Switzerland, United Kingdom, United States and Australia. The Workshop Communiqué contained the following key findings regarding regulations:

- Some regulatory regimes can be so complex that the effective regulation of the industry and the meeting of community expectations regarding the reduction of risk can be jeopardised.
- If regulations are to meet community expectations, protect the environment and reduce costs to industry, they must have clarity of purpose, transparency and engender trust.
- An effective, efficient and enforced risk-based regulatory framework for unconventional gas developments is essential to safeguard the environment, ensure


public safety, protect community interests and landowner rights, and ensure orderly developments.

- Regulations should be outcome-focussed, adaptive to new data and conditions, and be informed by the best available science, technology and practice. This ‘adaptive management’ approach allows new data to inform the decision makers.
- Regulatory leading practice can be achieved when operators are required to identify and manage agreed risks consistent with the ‘as low as reasonably practicable’ (ALARP) principle. It is broadly accepted that a goal-based approach, where it is the operator’s responsibility to identify all possible risks and how they are to be mitigated and demonstrably managed, is the most effective way to avoid damaging impacts on the environment and safety, and protect community interests and landowner rights, and help facilitate the achievement of a social license to operate.

Leading international regulatory practice can be reviewed and adopted to improve the Australian regulatory framework. The summary document provided to the Committee contains a section on international policy and regulation that may be useful to the inquiry.

**The unconventional gas industry in Australia as an energy provider (1h)**

Gas powered electricity generation (when combined with carbon capture utilisation and/or storage) has the potential to provide a complementary low carbon energy source to support the transition to a near-zero carbon economy. ATSE recommends that the Government use technology neutral incentives to drive this transition. The production of energy from shale gas is likely to be more financially viable if the Government were to implement mechanisms that address the externality costs of power generation (especially greenhouse emissions). However, ATSE cautions that there is currently considerable debate on whether gas is able to provide a low-carbon power source. Estimates of methane leakage (fugitive emissions) over the natural gas life cycle have varied significantly and have significant uncertainty attached to them. There is limited data on the extent of fugitive emissions but a pilot study undertaken by CSIRO in 2012 indicates that fugitive emissions from Australian coal seam gas wells appear to be lower than in the US. ATSE’s Unconventional Gas Communiqué notes that fugitive methane emissions must be considered over the lifetime of an unconventional gas project. As such they need to be carefully monitored. Further research is essential to remove uncertainties regarding the magnitude of these emissions.

**Recommended Reading**


International Reports

The following international reports have been used as source material for the attached confidential document. They include seven international Academies reports and two United States Government reports.

National Research Council (2012) - Induced Seismicity Potential in Energy Technologies (Full Report)

National Research Council (2010) - Management and Effects of Coalbed Methane Produced Water in Western United States (Full Report)

Council of Canadian Academies (2014) - Environmental Impacts of Shale Gas Extraction in Canada (Full Report)

The Royal Society and the Royal Academy of Engineering (2012) - Shale gas extraction in the UK: Review of hydraulic fracturing (Full Report)

European Academies Science Advisory Council (2014) – Shale gas extraction: issues of particular relevance to the European Union (Full Report)


United States Environmental Protection Agency (2015) – Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources (Full Report)