

Engineering Energy: Unconventional Gas Production

Report by the Australian Council of Learned Academies for
PMSEIC, June 2013

REPORT SUMMARY

Many Australian sedimentary basins are prospective for unconventional gas and the undiscovered resource base is very large.

The technology (such as horizontal wells, multi-well pads and hydraulic fracturing) is available to produce shale gas (and shale oil and tight gas) in Australia, but production costs are likely to be significantly higher than those in North America and the lack of infrastructure will further add to costs.

Shale gas will not be cheap gas in Australia, but it is likely to be plentiful and it has the potential to be an economically very important additional energy source.

Increased use of shale gas (and other gas) for electricity generation could significantly decrease Australia's greenhouse gas emissions based on gas replacing coal.

Because of the manner in which shale gas is produced it has the potential to impact on the landscape, on ecosystems, on surface and groundwater, on the atmosphere, on communities, and rarely may result in minor induced seismicity.

It will be vital for industry and government to recognise the complexity of the challenges posed by these possible impacts.

However, most can be minimised where an effective regulatory system and best monitoring practice are in place and can be remediated where they do occur.

If the shale gas industry is to earn and retain the social licence to operate, it is a matter of some urgency to have such a transparent, adaptive and effective regulatory system in place and implemented, backed by best practice monitoring in addition to credible and high quality baseline surveys.

Research into Australia's deep sedimentary basins and related landscapes, water resources and ecosystems, and how they can be monitored, will be essential to ensure that any shale gas production is effectively managed and the impacts minimised.



Australian Government

OFFICE OF THE
CHIEF SCIENTIST

Engineering Energy: Unconventional Gas Production

Recommendations

BACKGROUND

Australia has many sedimentary basins that are prospective for natural gas contained in deep shale. Substantial new research and exploration is required to turn that resource estimate into economic reserves, but following that there are no major technology gaps that will unduly hinder natural gas production from deep shale. Facilitating the necessary research and exploration provides opportunities to both the oil and gas industry and Australia more broadly, because the required focus is on understanding the dynamics of prospective sedimentary basins in their entirety (geology, hydrology, ecology).

A nascent industry producing natural gas from deep shale is already operating in Australia and has potential to further develop and deliver regional employment opportunities, address emerging domestic gas pressures and contribute to national income. Some existing and potential production areas will overlap with environmentally vulnerable locations (e.g. the Lake Eyre and Murray-Darling Basins) or be subject to competing land uses (e.g. critical habitat, agriculture, tourism, and urbanisation).

In order for the industry to earn and retain a social licence to operate community concerns must be addressed through adequate research on all potential impacts of natural gas production from deep shale, establishment of baseline environmental conditions, and ongoing monitoring. Effective, transparent and adaptive regulatory frameworks will be critical to ensure that potential environmental and social risks are mitigated. Best practice principles must be adhered to and impacts remediated where they occur. Building and maintaining robust, accurate, transparent and properly connected information sets on the technical, economic, environmental and social aspects related to the deployment of these technologies will be a critical enabler for these outcomes.

OBJECTIVE

The principal objective of these recommendations is to ensure that further industry expansion occurs and the benefits accrue with appropriate consideration of social, economic, and environmental factors and the support of the Australian community.

SCOPE

The following recommendations are based on evidence and expert analysis contained in the Australian Council of Learned Academies report – Engineering Energy: Unconventional Gas Production – produced on behalf of the Prime Minister’s Science, Engineering and Innovation Council (PMSEIC). The recommendations, developed by the Chief Scientist as executive officer of PMSEIC, are intended for

consideration collectively by the Commonwealth Government, State and Territory Governments and the oil and gas industry.

The ACOLA report specifically addressed aspects of shale gas production. Natural gas production from deep shale shares attributes with production from other sources of natural gas; including tight gas and to a lesser extent coal seam gas. Key differences are i) natural gas production from shale will likely have a larger footprint than production from coal seam, and ii) natural gas production from shale will likely require input of significantly greater amounts of water than production from coal seam, but it will also produce significantly less waste water .

While there is obvious scope and benefit in addressing the following recommendations across the breadth of natural gas production, from all onshore sources, the recommendations require due consideration of the specificities of natural gas production from shale.

Recommendation ONE

Support the scientific, economic and social research required to facilitate the safe and sustainable development of a new source of natural gas and oil (i.e. from deep shale); including that needed to build social acceptance and effective management regimes and regulatory frameworks.

PURPOSE

To proactively improve our knowledge base and understanding around the production of natural gas from shale and in particular our understanding of critical interactions with key social and environmental systems. Many of the prospective sedimentary basins in Australia are in environmentally vulnerable locations, subject to competing land uses and involve local and regional communities. At a national level, Australia's greenhouse gas account needs to be informed by best estimates of the greenhouse gas footprint for different energy sources, including oil and gas production from all sources.

- ▶ 1a. Support research into integrated basin management; necessary for the development of evidence-based policy to appropriately manage natural gas projects in multiple land-use and multiple jurisdictional frameworks.
- ▶ 1b. Support research to understand and communicate the economic benefits and potential risks (broadly defined) of natural gas and associated oil produced from shale; including the financial, social and environmental (including impact on the national greenhouse gas account) revenues and costs.
- ▶ 1c. Support research into the implications of natural gas development from new sources for Indigenous communities and the potential issues surrounding native title.

Recommendation TWO

Develop a comprehensive environmental risk assessment plan to monitor, and mitigate impacts of exploration and production on landscape and biodiversity.

PURPOSE

To provide community assurance that resource development is safe and sustainable by ensuring that impact assessment frameworks are in place prior to any significant exploration and production activity and are capable of effectively managing risk across the project life-cycle. Effective tools for impact management must be developed, and lessons from existing activities and related industries must be captured and applied. This could include the bio-regional assessments being undertaken through the Office of Water Science to inform decisions about coal seam gas and coal mining activities.

- ▶ 2a. Encourage the development of an industry-wide code of practice for the exploration, production, and impact management of natural gas production from shale. This should include a comprehensive framework for data management, sharing, and communication.
- ▶ 2b. Identify the necessary baseline data (geological, hydrological, environmental) to be collected, prior to commencement of exploration and production projects, against which project impacts can be fully and effectively evaluated. Data collection methods must be transparent and the data made publicly available.
- ▶ 2c. Identify the parameters and frequency of measurement required to implement an effective industry environmental monitoring regime for the project life-cycle. Monitoring should include, but not be limited to, surface and groundwater quality, greenhouse gas emissions, and seismicity. Independent auditing or some other means of ensuring community confidence will be required.

Recommendation THREE

Support research to understand the structure and dynamics of Australia's sedimentary basins that contain natural gas and oil associated with shale.

PURPOSE

The nature and dynamics of sedimentary basins influence all aspects of natural gas and oil production from shale; from exploration technologies, through production methods, to potential environmental and social impacts. New scientific knowledge is necessary to refine resource and reserve estimates; identify the geological constraints on production methods; and understand the interconnectedness of surface, shallow- and deep-aquifer waters and their capacity to support production and sustain the environment.

- ▶ 3a. Assess publicly available data, and identify and negotiate access to industry held data to identify knowledge gaps, particularly with respect to estimating economic reserves.
- ▶ 3b. Support research into the geological and geophysical aspects of prospective sedimentary basins; particularly basin structure, stress field and lithological characteristics to refine resource exploration models.
- ▶ 3c. Support research into the surface and groundwater dynamics of prospective sedimentary basins to better understand the likely impact on water resources from exploration, production and upstream-industry requirements.
- ▶ 3d. Implement policy to facilitate public access to geological, geophysical, and environmental data collected during exploration drilling and geophysical surveys.
- ▶ 3e. Identify a suitable agency to act as data custodian and support the development of a data base architecture for data storage and dissemination and sample curation that will permit researchers and policymakers to address multidisciplinary questions.

Recommendation FOUR

Through relevant frameworks (e.g. Commonwealth and Council of Australian Governments) build an efficient, transparent and effective regulatory system to achieve a resilient “compact” between the industry and communities.

PURPOSE

Many existing Australian regulations for onshore gas production will be applicable to natural gas from shale. Nonetheless the likely spatial scale of individual projects, that is particular to shale-related gas reserves, and the span of host sedimentary basins across multiple jurisdictions, demands additional considerations from governments and industry.

- ▶ 4a. Develop policy instruments to harmonise application of existing regulations across multiple jurisdictions, and areas subject to native title, to achieve integrated basin protection outcomes. The National Harmonised Framework for Natural Gas from coal seams, developed through the Council of Australian Governments Standing Council on Energy and Resources, may provide a starting point.
- ▶ 4b. Ensure that these instruments are capable of regulating activity involving multiple wells across large tracts of land. This contrasts with traditional, geographically constrained, projects and will require new regulatory models.
- ▶ 4c. Develop policy to manage the legacy of orphan wells long after the completion of projects. This will require advance planning to manage potential future impacts and to ensure sufficient funds are available should remediation and restoration actions be required.
- ▶ 4d. Ensure an adequate pool of expertise exists in the regulatory sector to properly assess projects relating to exploration and production of natural gas and associated oil from shale.