

UNCONVENTIONAL GAS: SHALE GAS AND COAL SEAM GAS

PROFESSOR SANDRA KENTISH

University of Melbourne & Member ACOLA Expert Working Group

and

DR VAUGHAN BECK

Deputy Chair, ACOLA Expert Working Group & Senior Technical Advisor,
Australian Academy of Technological Sciences and Engineering

The Australian Council of Learned Academies (ACOLA¹), Securing Australia's Future, Project 6 report, entitled *Engineering energy: unconventional gas production*, explored the scientific, social, cultural, technological, environmental and economic issues surrounding alternative energy sources, with particular reference to shale gas production. The project was one of a series of strategic research projects for the Prime Minister's Science, Engineering and Innovation Council. The project report made 51 key findings considering the potential technological, environmental, social and economic impacts of an Australian shale gas industry. Recommendations arising from the report were developed by the Office of the Chief Scientist in consultation with relevant government departments. The symposium presentation was based on the ACOLA project report.

The development of the shale gas industry in the United States over the past decade has had a major impact on the energy market in that country and on its economy, but has also raised a number of environmental questions. The Australian shale gas industry is very small by North American standards but has had some early success, and together with work on tight gas, it expects to spend more than \$500 million on exploration over the next one to two years. Given that the momentum of the industry in Australia is increasing, it is a matter of some urgency to more fully assess the nation's shale gas resources.

¹ *Securing Australia's Future* is a multiyear, multidisciplinary research program comprising a series of strategic research projects considering long-term issues. It is being undertaken by the Australian Council of Learned Academies (ACOLA). The project reports will be presented to the Prime Minister's Science Engineering and Innovation Council through the Office of the Chief Scientist and the Australian Research Council. ACOLA combines the four Learned Academies, namely: Australian Academy of Science, Academy of Social Sciences in Australia, Australian Academy of the Humanities and the Australian Academy of Technological Sciences and Engineering. An Expert Working Group was convened to undertake *Securing Australia's Future* Project 6; project services were provided by the Australian Academy of Technological Sciences and Engineering on behalf of the ACOLA Secretariat.

Australia's shale gas resource base is large, but uncertain. While shale gas exploration is still at an early stage, Australia must act quickly to assess its shale gas reserves and resources, as well as consider the potential social, economic and environmental impact of shale gas production. A driver for an Australian shale gas industry is that most of the announced coal seam gas (CSG) reserves are committed to the LNG industry from 2015–2016, with the potential for domestic gas shortages in eastern Australia and the prospect of large increases in gas prices. It is very likely that abundant shale gas will be found in Australia and this will help to ensure that there is no gas shortage. Some possibilities for the development of shale gas in Victoria are noted. But shale gas will not be cheap gas in most circumstances. It will require a relatively high price to make it profitable to produce. The current low price of shale gas in North America is not sustainable but production there is being maintained, despite the low price, either for contractual reasons and/or because some of the gas is produced as a byproduct of higher value oil derived from the shales. In Australia, shale gas will require a price of the order of \$6–9 a gigajoule (at the wellhead) to make its production and transport profitable compared with the current eastern Australian wholesale gas price of about \$4 a gigajoule. Production costs are likely to be significantly higher in Australia (compared with North American prices), and will be exacerbated by a lack of infrastructure (including gas pipelines); shale gas will not be cheap gas. However, if vast quantities of shale gas are produced, there may be economic benefits.

It is unlikely that there will be technological barriers related to shale gas production that could inhibit the development of an industry in Australia. However, some existing technologies and exploration models will need to be adapted to suit particular Australian environmental, geological and economic conditions.

The shale gas industry must earn and retain a 'social licence to operate'. Gaining and retaining a social licence to operate will be essential to the success of any Australian shale gas industry. A number of factors will be crucial

to building community confidence, including effective monitoring, transparency and the capacity to quickly remediate problems if they arise.

Monitoring of shale gas production and impacts is likely to be undertaken by petroleum companies as part of their normal operations, but in order to win community confidence, truly independent monitoring will need to be undertaken by government or other agencies and/or credible research bodies. Induced seismicity, aquifer contamination, landscape and ecosystem fragmentation, greenhouse and other emissions to the atmosphere, together with potentially adverse social impacts, are all likely to be areas of community concern that will need to be monitored and for which baseline surveys will be required.

The report highlighted that there are opportunities to learn from the Australian CSG experience. Due to the manner in which shale gas is produced, potential exists for environmental impacts, including impacts on the landscape, water systems (surface and groundwater), ecosystems, and through 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 shale gas production and minimisation (and avoidance) of potential impacts.

This will require a robust regulatory regime, which will build on existing regulations and which will also fully take account of the need for sensible and multiple land use, based around well-resourced regional planning and cumulative risk assessment. The regulation of abandoned

wells, the abandonment process and the long-term prospect of 'orphan wells' are topics that require more careful consideration by regulators. It is in the interests of government and industry to ensure that these issues are addressed, particularly to ensure that companies less experienced in shale developments can be enabled to follow best practice.

The Review did not gain the impression that shale gas in Australia will be a great bonanza that will be easily won. Rather it became evident that whilst shale gas has enormous potential, it will require great skill, persistence, capital and careful management of any impacts on ecosystems and related natural resources, to realise that potential. It will also need an informed and supportive community, and transparent and effective regulations and companion codes of practice. Provided we have all these in place (and the right rocks), shale gas could be an important new energy option for Australia.

Engineering energy: unconventional gas production can be found on the ACOLA website:
<http://acola.org.au/ACOLA/index.php/projects/securing-australia-s-future/project-6>

Recommendations arising from the report can be found here:
<http://www.chiefscientist.gov.au/wp-content/uploads/shalegas-recommendationsFINAL.pdf>