



Unconventional oil and gas in Australia: a case of regulatory lag

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(Received 18 April 2015; final version received 19 August 2015)

This article reviews existing Australian petroleum and mining legislation relating to the regulation of unconventional oil and gas; examines some of the recent policy responses in relation to coal seam gas developments in agricultural lands, the use of hydraulic fracturing and their impact on water resources; and identifies some of the reasons why law reform is required.

Keywords: Australia; unconventional oil and gas; regulatory status; policy developments

Introduction

Three natural gas liquefaction plants, involving an aggregate expenditure in excess of US\$70bn, are in the final stages of construction on Curtis Island, offshore Queensland. They are:

- Queensland Curtis LNG (QCLNG),¹ a two-train² project, which will produce 8.6 million tonnes of liquefied natural gas (LNG) per annum. QCLNG shipped its first cargo of LNG from the Project on 5 January 2015;
- Australia Pacific LNG (APLNG),³ a two-train project, which will produce nine million tonnes of LNG per annum. APLNG is expected to commence commissioning early in 2015, with the first shipment of LNG scheduled for mid-2015; and
- Gladstone LNG (GLNG),⁴ a two-train project, which will produce seven million tonnes of LNG per annum. GLNG is expected to commence commissioning mid-2015, with the first shipment of LNG scheduled for the fourth quarter of 2015.

Apart from the fact that tankers transporting LNG from these three plants to buyers in China, Japan and Singapore must navigate their way through the World Heritage-listed Great Barrier Reef Marine Park, they will be the first such plants in the world to use coal seam gas (CSG) as feedstock from which to produce LNG.

In 2011, the US Energy Information Administration estimated that the *technically recoverable* shale gas resources in Australia are 395 trillion cubic feet,⁵ where Australia's total

1 The Project Sponsors are QGC (a BG Group subsidiary) with 50 per cent of Train 1 and 100 per cent of Train 2, and CNOOC with 50 per cent of Train 1.

2 An LNG train is a gas purification and refrigeration plant that converts gas to a liquid (LNG) by cooling the gas to minus 162 degrees centigrade.

3 The Project Sponsors are Origin Energy with 37.5 per cent; ConocoPhillips with 37.5 per cent and Sinopec with 25 per cent.

4 The Project Sponsors are Santos with 30 per cent, PETRONAS with 27.5 per cent, Total with 27.5 per cent and KOGAS with 15 per cent.

5 US Energy Information Administration, *World Shale Gas Resources: An Initial Estimate of 14 Regions Outside the United States* (2011) <http://www.eia.gov/analysis/studies/worldshalegas/archive/2011/pdf/>

domestic consumption of natural gas is approximately 1.1 trillion cubic feet per annum. These resources are principally located in the Canning (470,000 square kilometres) and Onshore Perth (32,000 square kilometres) Basins in Western Australian; the Cooper Basin (130,000 square kilometres) in South Australia and Queensland; the Georgina Basin in the Northern Territory and Queensland; the Galilee and Bowen Basins in Queensland and the Sydney Basin (32,000 square kilometres) in New South Wales.

As regards the Canning Basin in Western Australia, the Energy Information Administration opined that it is among the largest five shale gas reserves in the world, with one of its features (the Goldwyer Shale, which extends across the Broome Platform and the Willara Sub-Basin) estimated to contain 764 trillion cubic feet of risked gas in place and 229 trillion cubic feet of risked recoverable gas.⁶

Despite the potential of Australian Basins to produce shale gas, comparatively few shale gas wells have been drilled. Santos, the leading Cooper Basin explorer, announced Australia's first commercial production of shale gas from the Moomba #191 well on 19 October 2012 and further commercial success with the Moomba #194 well on 19 December 2013. However, for the reasons set out in a report commissioned in 2013 by the Federal Government, being the Government of the Commonwealth of Australia, the expectation is that it will be a number of years before the large shale gas formations in Australia are brought into commercial production.⁷

However, it is the success of the shale industry in the United States that has enlivened interest in Australia. The recent technological advancements in horizontal drilling and hydraulic fracturing have resulted in spectacular increases in the production of shale oil and shale gas in the US. The International Energy Agency correctly forecast that US liquid petroleum (being oil and natural gas liquids) production would exceed that of Saudi Arabia in September 2014 for the first time since 1991. US liquid petroleum production in August 2014 was 11.5 million barrels per day. Further, imports of liquid petroleum in 2015 are expected to represent only 21 per cent of total annual consumption, compared with 60 per cent in 2005.⁸

Oil production from the Bakken Region in North Dakota and Montana has increased from approximately 180,000 barrels per day in 2007 to just under 1.2 million barrels per day in September 2014 and, in the same period, natural gas production has increased from less than 200 million cubic feet per day to approximately 1,400 million cubic feet per day. Similarly, natural gas production in the Marcellus Region of Pennsylvania, Ohio, New York State and West Virginia has increased from approximately 1,200 million cubic feet per day in 2007 to 16,000 million cubic feet per day in September 2014.⁹ In 2015 there has been significant curtailment in

fullreport_2011.pdf. In February 2014, the Western Australian Department of Mines, in its publication *Natural Gas From Shale and Tight Rocks – An Overview of Western Australia's Regulatory Framework* (2014), estimated that the Canning Basin contains approximately 235 tcf of shale and tight gas, while the Northern Perth Basin contains approximately 45 tcf.

6 See New Standard Energy Ltd's presentation, ASX Spotlight Conference, 2012 http://www.asx.com.au/smalltomidcaps/asia/may2012/pres_nse.pdf.

7 See *Engineering Energy: Unconventional Gas Production – A Study of Shale Gas in Australia* (ACOLA 2013) published in 2013 by the Working Group of the Australian Council of Learned Academies (ACOLA) for the Prime Minister's Science, Engineering and Innovation Council, through the Office of the Chief Scientist, as part of the 'Securing Australia's Future' project.

8 Ed Crooks and Anjali Raval, 'US poised to become world's leading liquid petroleum producer' *Financial Times* (FT.com) (London, 30 September 2014).

9 US Energy Information Administration, *Drilling Productivity Report* (September 2014).

shale oil and shale gas production in the US, as crude oil prices have declined in response to no decline in supplies from Saudi Arabia.

However, the global significance of the shale oil and shale gas industries in the US to traditional energy markets has recently been explained by an industry expert as follows:

What's happening in the oil market at the moment is fascinating because it's unprecedented. And the reason I say unprecedented is because we have now the advent of the shale industry as a threat to the traditional energy market, which of course is dominated by Saudi Arabia.

And over the past year, and most notably in the second half of last year, we had this fight for market share between Saudi Arabia and the other Gulf producers and the shale industry. Now, what's interesting about the oil market is the speed with which the shale industry can cut back on production or, when prices rise, increase production again.

That is unprecedented because if you look at the conventional oil industry, let's say we're developing offshore oilfields or even onshore, it takes many years to develop a new field. With the shale industry, the economics are such that they can actually develop new fields very quickly indeed. Now that means we've got some natural stabilisers because if the oil price goes back, let's say if we look at North Sea Brent as a benchmark, and the oil price goes back to US\$70 to US\$80, that immediately improves the economics of shale and production will come on line.

Likewise, if the oil price goes down to US\$40 per barrel, the shale industry economics get destroyed quite badly and production stops and therefore we've got a natural floor on the oil price.

So I think we're now stuck in a range of US\$40 – US\$80. I think that's actually good for the global economy because less volatile energy prices mean that economies can have actually a much higher degree of certainty.

If you compare oil prices today with where we were a year ago, and Brent peaked at close to US\$120 per barrel, this is a huge boost for countries in Europe and countries such as Japan, India and, for that matter, China, who are consumers of energy. It is not good news for exporters of energy.¹⁰

Definitional issues

Unconventional gas is CSG (also variously referred to as coal-bed or coal-mine methane gas), shale gas and 'tight' gas. Both CSG and shale gas are natural gas but, unlike natural gas produced from conventional reservoirs,¹¹ CSG and shale gas typically

¹⁰ Andrew Main, 'Threat of vanishing liquidity hangs over global markets, Credit Suisse warns' *The Australian* (Surry Hills, 2 June 2015) 23.

¹¹ The Guidelines for Application of the Petroleum Resources Management System (November 2011), sponsored by the Society of Petroleum Engineers, the American Association of Petroleum Geologists, the World Petroleum Council and the Society of Petroleum Evaluation Engineers (commonly referred to as the SPE-PRMS Guidelines) define conventional resources as those which: 'exist in discrete petroleum accumulations related to localized geological structural features and/or stratigraphic conditions, typically with each accumulation bounded by a downdip contact with an aquifer, and which is significantly affected by hydrodynamic influences such as buoyancy of petroleum in water'. (at 195).

The SPE-PRMS Guidelines define unconventional resources as: 'petroleum accumulations that are pervasive throughout a large area and that are not affected by hydrodynamic influences (also referred to as 'continuous-type deposits'). Examples include coal bed methane (CBM), basin-centred gas, shale gas, gas hydrate, natural bitumen (tar sands), and oil shale deposits. Typically, such accumulations require specialized extraction technology (e.g. dewatering of CBM, massive fracturing programs for shale gas, steam and/or solvents to mobilize bitumen for in-situ recovery, and in some cases, mining

contain heavier hydrocarbons, such as propane and butane, and do not contain natural gas condensate. In other words, they are lean or dry gas.¹²

When it comes to unconventional oil, there is general confusion as to the distinction between oil shale and shale oil. As it has been succinctly put, oil shale is sedimentary rock containing a solid organic compound known as kerogen from which oil can be produced and shale oil or, more accurately, oil-bearing shale is crude oil trapped in low porosity and low permeability rock, commonly shale, tight siltstone, limestone or dolomite.¹³ Shale gas is natural gas that is similarly trapped.

Kerogen, from which all oil and gas are ultimately derived, is oil shale which has not yet been exposed to sufficient heat to break it down into hydrocarbons. The processes of pyrolysis, hydrogenation and thermal dissolution convert kerogen into synthetic oil (sometimes referred to as kerogen oil) and gas. This conversion usually occurs *ex situ*. Where kerogen has been exposed *in situ* to heat within the earth's crust in the temperature range of 300C–500°C it is converted so that oil and gas are liberated and can flow naturally. When mined and treated, oil shale produces a dense oil that can be used as fuel oil or be beneficiated by adding hydrogen and removing impurities such as sulphur and nitrogen.

Oil shale is typically mined, rather than produced as petroleum, and is often referred to in the context of coal mining.¹⁴

Shale oil and shale gas are naturally occurring hydrocarbons that are trapped in very tight rock layers known as oil-bearing shales, just as CSG is a hydrocarbon that naturally occurs within a deposit of coal. In order to liberate the shale oil and shale gas from the oil-bearing shales, the modern technologies of horizontal drilling and hydraulic fracturing have been developed. Horizontal drilling enables a large area of shales to be exposed and hydraulic fracturing induces fractures in the tight rock layers thereby increasing the ability of the shale oil and shale gas to flow from the rock and be conveyed to the surface via the borehole. Shale oil is a 'light' (meaning it flows readily), 'sweet' (meaning it contains little sulphur) crude oil that can be refined in the same way as oil produced from conventional reservoirs. Shale oil is also referred to as 'tight oil'.

Bitumen¹⁵ *in situ* is an example of a naturally occurring hydrocarbon but, rather than being trapped in oil shale, it is a component of tar or oil sands in which it is combined with clay, sand and water. Tar sands are mined using open-cut mining and the bitumen is separated from the clay, sand and water by heating and then diluted to produce a less viscous oil suitable for transportation by pipelines.

activities). Moreover, the extracted petroleum may require significant processing prior to sale (e.g. bitumen upgraders'. (at 217).

12 This explains why the Japanese gas utilities, such as Tokyo Gas and Osaka Gas, are not among the buyers of LNG to be produced from CSG by the Queensland LNG projects. Gas sold in Japan must have a minimum calorific value and, given the leanness of Queensland CSG, the LNG would need to be 'spiked' with condensate before sale in Japan in order to meet the Japanese specification. There is no such requirement in China and the Japanese electricity utilities are not affected.

13 *The Basics: Oil Shale v Shale Oil* (Colorado Oil & Gas Association 2013), see www.COGA.org accessed 4th quarter 2014.

14 As early as 1941, New South Wales enacted the Coal and Oil Shale Mine Workers (Superannuation) Act 1941 (NSW) in which a mine worker was defined to be 'a person who is engaged in the coal or oil shale mining industries in New South Wales' or who is 'employed by an owner in or about a coal or oil shale mine in New South Wales'.

15 Naturally occurring bitumen is also referred to as asphalt, but should not be confused with petroleum pitch.

Legislative labyrinth

Existing regulation

Given the global significance of the shale industry and the likelihood that Australian sedimentary basins contain substantial reserves of unconventional oil and gas, it is timely to review the existing legislation to determine whether it is fit for purpose as regards the exploration for, and development and production of, unconventional oil and gas or whether it lags best regulatory practice.

The starting point for such a review is a determination of whether the various forms of unconventional oil and gas fall within the definition of petroleum in the relevant petroleum legislation or whether they fall within the definition of a mineral in the relevant mining legislation.¹⁶ Definitions of those terms and details of the legislation in which they appear are set out in the Schedule to this article.

Federal – offshore

The Federal Government has sovereignty over the areas from the seaward boundary of the Territorial Sea, which is located three nautical miles from low watermark, to the outer limit of the Continental Shelf and incline. Each State and the Northern Territory has sovereignty over the seabed adjacent to its land mass from low watermark to the outer limit of the Territorial Sea (the Adjacent Areas), as well as in respect of the islands and drying reefs on that part of the Continental Shelf which is located beyond the seaward boundary of such Adjacent Area.

Oil and gas operations in Federal waters are regulated by the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) (the Commonwealth Act) and mining operations there are regulated by the Offshore Minerals Act 1994 (Cth). As can be seen in the Schedule, petroleum is defined as any naturally occurring hydrocarbon or mixture of hydrocarbons occurring in gaseous, liquid or solid state. Shale and oil shale are included as minerals in the definition of mineral in section 22 of the Offshore Minerals Act, but there is no definition of shale or oil shale in either Act.

However, section 2 of the Petroleum Resource Rent Tax Assessment Act 1987 (Cth) does define oil shale as follows: ‘oil shale means any shale or other rock (other than coal) from which a fluid consisting of or including hydrocarbons may be extracted or produced’.

Section 35 of the Offshore Minerals Act stipulates that this Act does not apply to the exploration for or recovery of petroleum.

Despite the fact that shale and oil shale are minerals the mining of which is regulated by the Offshore Minerals Act, where the purpose of the mining operations is the extraction or production of any naturally occurring hydrocarbon or any naturally occurring mixture of hydrocarbons, the exploration for and recovery of those hydrocarbons is regulated by the Commonwealth Act to the exclusion of the Offshore Minerals Act. If the definition of oil shale in the Petroleum Resource Rent Assessment Act were to be applied to the Offshore Minerals Act, where the hydrocarbons in shale or other

¹⁶ Even though shale, shale oil and shale gas are generally regarded as minerals in the United States (see, for example, *United States Steel Corporation v Hoge* 468 A2d 1380 (Pa 1983)), that proposition has been rejected in other States (see, for example, *Butler v Charles Powers Estate*, No 27 MAP 2012; 2013 Pa LEXIS 789 (Pa 24 April 2013)). See also Mikal C Watts and Emily C Jeffcott, ‘Does He Who Owns the “Minerals” Own the Shale Gas? A Guide to Shale Mineral Classification’ (2012–13) 8 *Tex J Oil, Gas and Energy Law* 27.

rock are not naturally occurring, the shale or oil shale would have to be mined as minerals under the Offshore Minerals Act in order to extract or produce it.

States and Northern Territory – offshore

Each of the States and the Northern Territory has adopted in respect of its Adjacent Area legislation, substantially in common form, regulating oil and gas operations in that area.¹⁷ That legislation adopts the same definition of petroleum as is set out in the Commonwealth Act.

The position as regards offshore minerals in the Adjacent Areas differs from the other States in Victoria, the Northern Territory and Tasmania.

WESTERN AUSTRALIA, SOUTH AUSTRALIA, NEW SOUTH WALES AND QUEENSLAND

The position as regards offshore petroleum and mining is the same as is applicable under the Commonwealth Act and the Offshore Minerals Act.

VICTORIA

By the Underseas Mineral Resources Act 1963 (Vic), the provisions of the Mineral Resources (Sustainable Development) Act 1990 (Vic) are declared to extend and apply to the seabed and its subsoil in Victoria's Adjacent Area.

The definition of petroleum in section 4(1) of the Mineral Resources (Sustainable Development) Act is, in substance, the same as the definition in the Commonwealth Act, except that it provides that petroleum does not include any naturally occurring hydrocarbon or mixture of hydrocarbons within a deposit of coal or oil shale.

Section 4(1) of the Mineral Resources (Sustainable Development) Act defines mineral to include oil shale and 'hydrocarbons and mineral oils contained in oil shale or coal or extracted from oil shale or coal by chemical or industrial processes'. Parenthetically, this inclusion in the definition of mineral raises the question whether hydraulic fracturing is a chemical or industrial process by which hydrocarbons or mineral oils are extracted from oil shale or coal.

The Victorian legislation does not define the term 'oil shale'. If shale oil and shale gas are, for the purposes of section 4(1) of the Mineral Resources (Sustainable Development) Act, interpreted to be hydrocarbons or a mixture of hydrocarbons naturally occurring in a deposit of oil shale (as distinct from oil-bearing shales) and CSG is interpreted to be a hydrocarbon or mixture of hydrocarbons naturally occurring within a deposit of coal, they are not petroleum as defined.

As noted earlier,¹⁸ the conventional view of oil shale is that it is comprised of kerogen from which oil and gas can be extracted by breaking down the kerogen into hydrocarbons by distillation or some other chemical or thermal process, either in situ or ex situ. As such, hydrocarbons or mixtures of hydrocarbons do not naturally occur in oil shale. But shale oil and shale gas do naturally occur in oil-bearing shales and, hence, the better view seems to be that they can be explored for and produced as petroleum.

¹⁷ Western Australia – Petroleum (Submerged Lands) Act 1982; South Australia – Petroleum (Submerged Lands) Act 1982; Victoria – Offshore Petroleum and Greenhouse Gas Storage Act 2010; New South Wales – Petroleum (Offshore) Act 1982; Queensland – Petroleum (Submerged Lands) Act 1982; Northern Territory – Petroleum (Submerged Lands) Act 1982; Tasmania – Petroleum (Submerged Lands) Act 1982.

¹⁸ See n 13.

In the case of CSG, it is a hydrocarbon ‘contained ... in ... coal’ and, accordingly, can be mined as a mineral, rather than produced as petroleum. Assuming they are not contained within a deposit of oil shale or coal, tar sands would seem to be petroleum as defined, even though they are typically produced by mining operations.

NORTHERN TERRITORY

By virtue of section 3(1) of the Coastal Waters (Northern Territory Powers) Act 1980 (Cth), the land of the Territory includes its Adjacent Area and section 5(2) of the Mineral Titles Act 2010 (NT) provides that it applies to all of the land of the Territory.

Section 9 of the Mineral Titles Act defines mineral as inorganic elements or compounds and organic carbonate compounds obtainable by mining: coal, lignite, oil shale and salt, and other substances prescribed by regulation, but does not include petroleum as defined in section 5(1) of the Petroleum Act 1984 (NT). Oil shale is not defined.

The definition of petroleum in section 5(1) of the Petroleum Act is, in substance, the same as the definition in the Commonwealth Act, except that it provides that petroleum ‘does not include a substance which, in its naturally occurring state, is not recoverable from a well by conventional means’.¹⁹ No Explanatory Memorandum was produced in 1984 at the time of introduction of the Petroleum Bill to explain the reference to ‘conventional means’ and there was no reference to it in the parliamentary debates in relation to the Bill.

The Petroleum (Submerged Lands) Act 1982 (NT) regulates petroleum operations in the Adjacent Area offshore the Northern Territory. The definition of petroleum in that Act does not incorporate the exception referred to in the preceding paragraph. So substances that, in their naturally occurring state, are not recoverable from a well by conventional means are not petroleum for the purposes of the exclusion in the definition of minerals in the Mineral Titles Act, but are, assuming they are naturally occurring hydrocarbons, or a naturally occurring mixture of hydrocarbons, petroleum which may be explored for and produced from the Adjacent Area under the Petroleum (Submerged Lands) Act.

However, it could lead to a contest for jurisdiction between the Mineral Titles Act and the Petroleum (Submerged Lands) Act as to whether naturally occurring hydrocarbons which are not recoverable from a well by conventional means should be extracted or produced by mining²⁰ under the Mineral Titles Act or produced as petroleum under the Petroleum (Submerged Lands) Act.

TASMANIA

The only legislation specifically applicable to the production of natural resources in Tasmania’s Adjacent Area is the Petroleum (Submerged Lands) Act 1982 (Tas), which regulates the exploration for, and production of, petroleum (defined as in section 7 of the Commonwealth Act).

If unconventional oil or gas is not in the form of a naturally occurring hydrocarbon, or a naturally occurring mixture of hydrocarbons, which can be explored for and

¹⁹ Section 5(1) of the Petroleum Act defines well to mean ‘a hole in the surface of land or the sea-bed made by drilling, boring or other means in connection with the exploration for, or operations for the recovery of, petroleum, but does not include a seismic shot hole’.

²⁰ Section 12(1) of the Mineral Titles Act defines mining as ‘the extraction of minerals or extractive minerals from land of the Territory by one of the following means: (a) underground, surface or open-cut workings; (b) on-site leaching; (c) dredging; (d) another method prescribed by regulation’.

produced as petroleum from Tasmania's Adjacent Area under the Petroleum (Submerged Lands) Act, there is no offshore mining legislative regime which would allow shale, oil shale, coal or other minerals to be mined there to extract hydrocarbons.

States and Northern Territory – onshore

The position as regards the onshore areas of the States and the Northern Territory tends to be more complicated.

WESTERN AUSTRALIA

Section 5(1) of the Petroleum and Geothermal Energy Resources Act 1967 (WA) adopts, in substance, the same definition of petroleum as is set out in the Commonwealth Act and set out in paragraph 3.2(c) above, with the exception that oil shale is expressly excluded from the definition of petroleum.

Section 5(1) of the Petroleum and Geothermal Energy Resources Act defines oil shale to include 'naturally occurring hydrocarbons that are or may be contained in rocks from which they cannot be recovered otherwise than by mining those rocks as oil shale'.

The first issue with this definition is that, unlike the definitions in the onshore legislation in Queensland and Tasmania, it contemplates that the hydrocarbons are naturally occurring. As noted above,²¹ hydrocarbons do not naturally occur in oil shale. The second issue is the obvious circularity of the definition. Naturally occurring hydrocarbons that are or may be contained in rocks are only included in the definition of oil shale if those hydrocarbons can only be recovered by mining those rocks as oil shale.

Given that CSG, shale oil and shale gas are not recoverable by mining rocks as oil shale, they are not excluded from the definition of petroleum in the Petroleum and Geothermal Energy Resources Act and, accordingly, can be explored for and produced under that Act.

Section 8(1) of the Mining Act 1978 (WA) incorporates the same definition of oil shale as is adopted in the Petroleum and Geothermal Energy Resources Act and defines minerals to exclude, among other substances, petroleum recoverable under Western Australia's petroleum legislation and shale, other than oil shale.

Hence, oil shale is only capable of being mined as a mineral under the Mining Act.

SOUTH AUSTRALIA

Section 4(1) of the Petroleum and Geothermal Energy Act 2000 (SA) defines petroleum by excluding coal and shale 'unless occurring in circumstances in which the use of techniques for coal seam methane production or in situ gasification would be appropriate or unless constituting a product of coal gasification (whether produced below or above the ground) for the purposes of production of synthetic petroleum'.

Accordingly, coal and shale are excluded from the definition of petroleum, unless:

- the hydrocarbons occur in circumstances in which the use of techniques for CSG production would be appropriate;

²¹ See 6, Victoria.

- the hydrocarbons occur in circumstances in which the use of in situ gasification would be appropriate. This does not include coal gasification, which is referred to separately in the next paragraph. In situ gasification is more likely to occur in relation to oil shale operations to produce synthetic petroleum, but in this instance it is shale, rather than oil shale, which is included in the definition of petroleum if it is used for in situ gasification; or
- the hydrocarbons constitute a product of coal gasification (whether produced below or above ground) for the purposes of production of synthetic petroleum. This would include the conversion of coal to gas, a process which produces town gas, and coal liquefaction.

In each of the above cases, coal and shale are included in the definition of petroleum.

Section 6(1) of the Mining Act 1971 (SA) defines minerals to include, among other substances, naturally occurring deposits of coal, oil shale and shale, but excludes petroleum and any other substance the recovery or production of which is governed by the Petroleum and Geothermal Energy Act.

Oil shale is not defined in the Mining Act.

VICTORIA

Section 6 of the Petroleum Act 1998 (Vic) adopts, in substance, the same definition of petroleum as is set out in the Mineral Resources (Sustainable Development) Act, including the exception that naturally occurring hydrocarbons, or mixture of hydrocarbons, within a deposit of coal or oil shale are not petroleum as defined. This gives rise to the issues discussed in paragraph 3.3(b) above.

NEW SOUTH WALES

The Petroleum (Onshore) Act 1991 (NSW) adopts, in substance, the same definition of petroleum as is set out in the Commonwealth Act with the exception that petroleum 'does not include coal or oil shale or any substance prescribed to be a mineral for the purposes of the Mining Act 1992'.²²

The Dictionary at the end of the Mining Act 1992 (NSW) defines mineral as follows: '**Mineral** means any substance prescribed by the regulations as a mineral for the purposes of this definition, and includes coal and oil shale, but does not include petroleum'.

There is no definition of oil shale in these Acts, but, under section 4(1) of the Mine Subsidence Compensation Act 1961 (NSW), shale is defined to mean oil shale. Further, in regulation 3(1) of the Mining Regulation 2010 (NSW), there is a definition of clay/shale (essentially to exclude clay or shale used in making fired building or construction products or in road making) and, under Schedule 6 to the Regulations, clay/shale is subject to royalty, but oil shale is not (presumably on the basis that synthetic oil or gas produced from oil shale will be subject to royalty on petroleum at the rate prescribed by regulation 23 of the Petroleum (Onshore) Regulation 2007 (NSW), for the purposes of section 85(2) of the Petroleum (Onshore) Act, and by regulation 24, for the purposes of Division 3 of Part 14 of the Mining Act).

²² Clay/shale, coal, oil shale and structural clay are, among others, prescribed to be minerals for the purposes of the Mining Act by Schedule 1 to the Mining Regulation 2010 (NSW).

QUEENSLAND

The exploration for and production of oil and gas in Queensland are principally regulated by the Petroleum Act 1923 (Qld) (the 1923 Act) and the Petroleum and Gas (Production and Safety) Act 2004 (Qld) (the 2004 Act).

Section 10(1) of the 2004 Act defines petroleum to include substances necessarily extracted or produced as a by-product of extracting or producing naturally occurring hydrocarbons and hydrocarbon fluids (referred to as ‘gas and retorting products’²³) extracted or produced from coal or oil shale by a chemical or thermal process.

However, Section 10(3) of the 2004 Act clarifies that petroleum does not include, among other substances, coal or oil shale.

There are separate definitions in the 2004 Act of coal seam gas and oil shale. Section 299(1) defines coal seam gas as ‘petroleum (in any state) occurring naturally in association with coal or oil shale, or in strata associated with coal or oil shale mining’. Section 300 defines oil shale as ‘any shale or other rock (other than coal) from which a gasification or retorting product may be extracted or produced’.

Exploration for oil shale may be conducted under an exploration permit or mineral development licence granted under the Mineral Resources Act 1989 (Qld) for oil shale²⁴ and oil shale may be ‘mined’ to extract or produce a gasification or retorting product under an oil shale exploration tenement, an oil shale mining lease granted under the Mineral Resources Act or a coal mining lease granted under the Mineral Resources Act, where the coal mining lease is a specific purpose lease for a purpose associated with, arising from or promoting the activity of coal mining, whether or not it is also granted for a purpose other than coal mining (eg, the production of CSG in association with coal mining or the ‘mining’ of oil shale).²⁵

Section 2 of the 1923 Act, adopts, in substance, the same definition of petroleum as is set out in the Commonwealth Act but it declares that petroleum does not include, and never did include, among other substances, shale from which mineral oil may be extracted or produced; mineral oil extracted or produced from shale or rock by some chemical or thermal process; hydrocarbons necessarily mined, extracted, produced or released by or in connection with the mining for shale or coal or the production of mineral oil therefrom; or shale or other rock from which a gas or retorting product may be extracted or produced.

Mineral oil is produced or extracted from oil shale by distillation or other chemical or industrial processes.²⁶

The exclusion from the definition of petroleum, by section 2(f) of the 1923 Act, of ‘hydrocarbons ... necessarily mined, extracted, produced or released by or in connection with mining for shale or coal’ is complemented by section 150(1) and (2), which were added to the 1923 Act in 1996.²⁷ Those subsections provide that:

²³ See s 10(1)(c) of the 2004 Act.

²⁴ Section 302(1) of the 2004 Act.

²⁵ Section 303 of the 2004 Act.

²⁶ Coal and mineral oil leases were granted under state legislation as early as 1893, but the term ‘mineral oil’ is thought to refer to oil shale, which had been a source of kerosene in Australia since 1865: see T Daintith, *Finders Keepers? How the Law of Capture Shaped the World Oil Industry* (RFF Press 2010), at 328 and 329. Curiously, the term appeared again as recently as 1987 in s 3(1) of the Aboriginal Land (Lake Condah and Framlingham Forest) Act (Cth) where mineral is defined to include ‘hydrocarbons and mineral oils contained in oil shale or coal or extracted from oil shale or coal by chemical or industrial processes’.

²⁷ Petroleum Amendment Act (No 1) 1996 (Qld).

- (1) This section applies to a 1923 Act petroleum tenure, (*a petroleum interest*) granted before or after the commencement of this section for hydrocarbons naturally occurring in association with coal (*coal seam gas*).
- (2) To remove any doubt, this Act applies, and is taken always to have applied, to the petroleum interest as if coal seam gas were petroleum.²⁸

Hence, where hydrocarbons are necessarily mined, extracted, produced or released in connection with the mining for shale or coal, those hydrocarbons are not regarded as being petroleum, but rather a mineral which is explored for and mined under the Mineral Resources Act. Conversely, if coal seam gas is not *necessarily* mined, extracted, produced or released in connection with the mining for shale or coal, it is petroleum which is explored for and produced under the 1923 Act or the 2004 Act (as applicable). This explains the dichotomy referred to in the following paragraph.

Part 6F of the 1923 Act, Chapter 3 of the 2004 Act and Part 8 of the Mineral Resources Act are all expressed to be for the main purpose of clarifying the rights to explore for and produce coal seam gas and to ‘address issues arising for coal seam gas exploration ... when a petroleum tenure or a coal or oil shale mining tenement are granted over the same area’.²⁹ In both section 76K(1) of the 1923 Act and section 299(1) of the 2004 Act, coal seam gas is defined to be ‘petroleum (in any state) occurring naturally in association with coal or oil shale, or in strata associated with coal or oil shale mining’.

However, section 6(2) of the Mineral Resources Act stipulates that, among other substances, each of CSG, a product extracted or produced by an underground gasification process for coal or oil shale, and oil shale is a mineral.

The right of the holder of a coal mining lease or an oil shale lease to mine, extract, produce, release or dispose of CSG under the Mineral Resources Act is limited by section 318CM to incidental coal seam gas as follows:

- (1) The mining lease holder may mine coal seam gas in the area of the lease only if –
 - (a) the mining happens as a necessary result of coal or oil shale mining carried out under the mining lease; or
 - (b) the mining is necessary to ensure a safe mining working environment for coal or oil shale mining under the mining lease; or
 - (c) the mining is necessary to minimise the fugitive emission of methane during the course of coal mining operations.

It is to be noted that section 2(f) of the 1923 Act uses the phrase ‘necessarily mined, extracted, produced or released by or in connection with the mining for shale or coal’, whereas section 318CM(1)(a) of the Mineral Resources Act uses the phrase ‘the mining happens as a necessary result of coal or shale mining carried out under the mining lease’. There has always been some uncertainty as to what is intended by the use of the word ‘necessarily’ in section 2(f) of the 1923 Act. Ensuring a safe mining working environment and minimising the fugitive emission of methane as stipulated in section 318CM(1)(b) and (c) of the Mineral Resources Act are clearly

²⁸ Section 10(5) of the 2004 Act provides: ‘(5) To remove doubt, it is declared that, for this Act and petroleum authorities under it, this section preserves, for this Act, the effect of section 150(2) and (3) of the 1923 Act’.

²⁹ See s 76H(a) and (b) of the 1923 Act; s 295(a) and (b) of the 2004 Act, and s 18A (a) and (b) of the Mineral Resources Act.

examples of necessity, but the concept that hydrocarbons can otherwise be mined as the *necessary result* of mining the coal or shale under a mining lease suggests some causal connection between the mining of the coal or shale and the production of the hydrocarbons.³⁰

NORTHERN TERRITORY

The mining of minerals, both onshore and offshore, is regulated by the Mineral Titles Act 2010 (NT) and onshore petroleum operations are regulated by the Petroleum Act 1984 (NT). The definitional issues are as described in paragraph 3.3(c).

It is interesting to speculate whether, in 1984, the recovery of unconventional oil or gas by use of horizontal drilling and/or hydraulic fracturing would have been regarded as the production of a substance which, in its naturally occurring state (ie, trapped in oil-bearing shales) would have been regarded as recoverable from a well by conventional means.

TASMANIA

The Mineral Resources Development Act 1995 (Tas), which regulates the exploration for and the production or mining of all mineral resources, coal, oil, gas, petroleum and geothermal products in Tasmania, incorporates comprehensive definitions which are set out in the Schedule.

The definitions in section 5 of the Mineral Resources Development Act provide for the following allocation:

- that oil shale, being a shale which requires distillation to yield liquid or gaseous hydrocarbons and being a Category 2 mineral, must be mined under a mining lease granted under Part 4 of the Act;
- that CSG (being coal bed methane gas and any naturally occurring hydrocarbon, or mixture of hydrocarbons, that is within a deposit of coal or oil shale), not being petroleum as defined and being a Category 2 mineral, must be mined under a mining lease granted under Part 4 of the Act;
- that shale oil, being petroleum (but not coal seam gas or gas) as defined and being a Category 4 mineral, must be produced under a petroleum production licence granted under Part 3A of the Act; and
- that shale gas, being petroleum (but not coal seam gas) as defined and being a Category 4 mineral, must be produced under a petroleum production licence granted under Part 3A of the Act.

Offshore and onshore legislation – conclusions

As regards unconventional oil and gas, a number of conclusions may be drawn from the review above:

- The legislation provides that shale and oil shale are minerals to be mined. Where oil shale is defined, the definition either refers to a shale or rock from which hydrocarbons may be extracted or produced by distillation or some other chemical or thermal

³⁰ S Johnston, 'Whose Right? The Adequacy of the Law Governing Coal Seam Gas Development in Queensland' (2001) 20 *AMPLJ* 258 at 264–66.

process, or it refers to naturally occurring hydrocarbons contained in rocks that can only be recovered by mining the rocks as oil shale. The reference to naturally occurring hydrocarbons in the context of oil shale is, it is suggested, in error because the mining of oil shale produces synthetic oil and gas, which are not naturally occurring.

- The legislation does not refer to oil-bearing shales, which are the source of shale oil and shale gas and which are naturally occurring hydrocarbons. Hence, shale oil and shale gas are not extracted or produced from oil shale. It is assumed that oil-bearing shales are, for purposes of the legislation, a particular type of shale. Even though shale is a mineral to be mined, shale oil and shale gas are petroleum as defined and the mining legislation typically provides that it does not apply to the exploration for or recovery of petroleum.
- CSG is the subject of varied legislative treatment. It may be mined as a mineral where it is contained in coal; it may be produced as petroleum as a naturally occurring hydrocarbon; or it may be mined as a mineral or produced as petroleum depending upon whether or not it is necessarily mined, extracted, produced or released in connection with the mining for shale or coal.
- As for other unconventional hydrocarbons which are naturally occurring, such as bitumen contained in tar or oil sands, the legislation provides for them to be produced as petroleum, even though in other jurisdictions they would be mined and even though they are often heated or diluted to produce a less viscous oil suitable for transportation by pipelines.

Commonwealth – onshore

When the Federation was formed in 1901, the States ceded to the Commonwealth of Australia the ‘power to make laws for the peace, order, and good government of the Commonwealth with respect to’ 40 heads of power which are set out in section 51 of the Constitution. All residual powers are vested in the States. While section 51 of the Constitution does not expressly empower the Commonwealth to make laws with respect to environmental matters, other heads of power have been construed as empowering the Commonwealth to do so. For example, the power in section 51 (xxix) of the Constitution to make laws with respect to external affairs has been held by the High Court of Australia³¹ to give the Commonwealth jurisdiction to make laws for the purposes of implementing Australia’s international obligations, including under treaties relating to environmental matters,³² ozone protection³³ and the management of hazardous waste.³⁴ The Commonwealth’s power to make laws with respect to environmental matters has also been held to derive from the powers to make laws with respect to ‘Trade and commerce with other countries, and among the States’,³⁵ ‘Fisheries in Australian waters beyond territorial

³¹ *Koowarta v Bjelke-Petersen* (1982) 153 CLR 168.

³² For example, the Convention concerning the Protection of the World Cultural and Natural Heritage 1975; the Convention on Wetlands of International Importance especially as Waterfowl Habitat 1975; the Convention on Biological Diversity 1992; Japan–Australia Migratory Bird Agreement; China–Australia Migratory Bird Agreement; the Convention on the Conservation of Migratory Species of Wild Animals; and the Convention on International Trade in Endangered Species of Wild Fauna and Flora 1976.

³³ The Vienna Convention for the Protection of the Ozone Layer 1985.

³⁴ The Basel Convention on the Control of Hazardous Wastes and their Disposal 1985.

³⁵ Section 51(i) of the Constitution.

limits³⁶ and ‘Foreign corporations, and trading or financial corporations formed within the limits of the Commonwealth’.³⁷

In the present context, the relevance of the Commonwealth’s power to make laws with respect to environmental matters is that the only reference to coal seam gas in Commonwealth legislation is to be found in the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act). The management of the water resources of a State or Territory is typically within the powers of the State or Territory and, but for the powers of the Commonwealth to make laws with respect to environmental matters, would be beyond the Constitutional powers of the Commonwealth. However, such has been the concern of the public about the impact on water resources of CSG development and large coal mining development that the Commonwealth has used Part 3 (sections 24D and 24E) to legislate for a ‘water trigger’ to protect them.

Section 24D(1) of the EPBC Act provides that a Commonwealth agency must not take action involving a CSG development or a large coal mining development if the action has, will have or is likely to have a significant impact on a water resource. Section 24E(1) of the EPBC Act creates an offence for a breach of section 24D(1).

Section 131AB(1) of the EPBC Act provides:

- (1) This section applies if:
 - (a) the taking of an action, for the purposes of a controlling provision,³⁸ involves:
 - (i) coal seam gas development; or
 - (ii) large coal mining development; and
 - (b) the Minister believes that the taking of the action:
 - (i) is likely to have a significant impact on water resources, including any impacts of associated salt production and/or salinity; and
 - (ii) may have an adverse impact on a matter protected by a provision of Part 3.³⁹
- (2) Before the Minister decides whether or not to approve, for the purposes of the controlling provision, the taking of the action, the Minister must obtain the advice of the Independent Expert Scientific Committee on the coal seam gas or large coal mining development.

With some circularity, coal seam gas development is defined in section 528 of the EPBC Act to mean:

any activity involving coal seam gas extraction that has, or is likely to have, a significant impact on water resources (including any impacts of associated salt production and/or salinity):

- (a) in its own right; or
- (b) when considered with other developments, whether past, present or reasonably foreseeable developments.

There is no definition of coal seam gas in the EPBC Act.

Having been passed by the House of Representatives, the Environment Protection and Biodiversity Conservation Amendment (Bilateral Agreement Implementation) Bill 2014 has, as at the date of writing, been referred by the Senate for review by a Committee.

³⁶ Section 51(x) of the Constitution.

³⁷ Section 51(xx) of the Constitution.

³⁸ Section 67 of the EPBC Act defines controlling provision as: ‘An action that a person proposes to take is a **controlled action** if the taking of the action by the person without approval under Part 9 for the purposes of Part 3 would be (or would, but for section 25AA or 28AB, be) prohibited by this provision. The provision is a **controlling provision**’.

³⁹ Part 3 of the EPBC Act sets out the Requirements for Environmental Approval.

The principal purpose of the Bill is to deliver a ‘one-stop shop’ for environmental approvals by accrediting State and Territory environmental planning systems for assessment and approval purposes under the EPBC Act and by minimising duplication in the environmental assessment and approval processes. Accreditation will be available to those States and Territories which enter into Bilateral Agreements with the Commonwealth.⁴⁰

A Bilateral Agreement is either an Assessment Bilateral Agreement or an Approval Bilateral Agreement. An Assessment Bilateral Agreement allows an accredited State or Territory to conduct the assessment of the proposed action, but reserves to the Commonwealth the final decision as to whether or not to approve that action. An Approval Bilateral Agreement allows the accredited State or Territory to both assess and approve (or not approve) the proposed action.⁴¹

Bilateral Agreements must include an undertaking on the part of the State or Territory that, where action described in section 24D or section 24E is proposed, ‘the appropriate State or Territory Minister will obtain the advice of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mine Development if the taking of action, or a class of action that includes the action, is likely to have a significant impact on water resources, including any impacts of associated salt production and/or salinity, and must take that advice into account when deciding whether or not to approve the taking of the action’.⁴²

Except as referred to above, there is no definition of coal seam gas, shale gas, shale oil or oil shale in any current Commonwealth legislation.⁴³

The focus of the EPBC Act on CSG and water resources is somewhat unsurprising. In April 2012, the Australian Broadcasting Corporation forecast⁴⁴ that:

- up to 40,000 CSG wells will be drilled in Queensland over the next 20 years;
- those wells will draw water from the coal seams at the rate of approximately 300 gigitalitres per year. CSG wells drilled in the Surat Basin in Queensland can be prolific producers of water, in contrast to CSG wells drilled in the Sydney Basin in New South Wales;⁴⁵ and
- over the next 30 years, the CSG wells in Queensland are estimated to produce some 31 million tonnes of salt.

⁴⁰ Western Australia entered into a Bilateral Agreement with the Commonwealth on 3 October 2014; South Australia entered into a Bilateral Agreement with the Commonwealth on 24 September 2014; Victoria entered into a Bilateral Agreement with the Commonwealth on 27 October 2014; New South Wales entered into a Bilateral Agreement with the Commonwealth on 19 December 2013; Queensland entered into a Bilateral Agreement with the Commonwealth on 11 August 2009, which was amended on 12 December 2009, 14 June 2012, 13 December 2013 and 18 December 2014, and Tasmania entered into a Bilateral Agreement with the Commonwealth on 22 October 2014. The Northern Territory has entered into a Memorandum of Understanding dated 19 December 2013 with the Commonwealth agreeing to negotiate a Bilateral Agreement, but, to date, the terms of that Agreement have not been concluded.

⁴¹ See s 47 of the EPBC Act.

⁴² Schedule 3, Part 1, Clause 2C to the Bill, which proposes the insertion of subsection 48A(2A).

⁴³ See, the definition of oil shale, 5. Interestingly, the Shale Oil Bounty Act 1917 (Cth) (which was repealed in 1934) applied to crude shale oil produced in Australia from mined kerosene shale. The Shale Oil Bounty Regulations 1928 (Cth) (also repealed in 1934) included the definition: ‘*Oil* means crude shale oil, a product obtained by destructive distillation (known as retorting) of mined kerosene shale and to which product no process of refining has been applied’.

⁴⁴ ABC Radio Multiplatform & Content Development report aired on ABC Radio.

⁴⁵ ‘Water and Coal Seam Gas/Fact Sheet 4’ (New South Wales Department of Primary Industries, Office of Water, April 2014). Each CSG well in the Surat Basin produces between 7 and 300 megalitres of water per year, whereas CSG wells in the Sydney Basin only produce up to 30 megalitres of water per year. In fact, in 2012, all of the CSG wells in New South Wales only produced in aggregate 4.8 megalitres of water.

Less than five per cent of the CSG wells drilled in Australia have been subject to hydraulic fracturing.⁴⁶ It is also the case that the amount of water produced by completed shale gas and shale oil wells is small when compared to CSG wells. However, it is indicative of the state of regulatory lag in Australia that the recent amendments to the EPBC Act have not sought to address the water issues arising from hydraulic fracturing of other unconventional oil and gas wells.

According to the US Energy Information Administration, some 27,000 new gas wells were completed in the US in 2011, with a substantial majority being shale gas wells.⁴⁷ In order to stimulate a shale gas or shale oil well by hydraulic fracturing, approximately two million US gallons (being 7,570,000 litres) of water are required to conduct a single operation, with some wells requiring up to ten hydraulic fracturing operations in order for the oil or gas to flow. Typically, about 80 per cent of the water used is trapped in the oil-bearing shales and the remaining 20 per cent flows back up the well bore to the surface as contaminated water (flow-back water). The flow-back water must be contained and treated by some combination of dilution, evaporation, filtering or chemical modification, or be re-injected for storage in deep wells.⁴⁸ Treatment of flow-back water is particularly sensitive where the hydraulic fracturing utilises a combination of sand, water and so-called BTEX chemicals⁴⁹ in the stimulation operations. Water contamination and methane leakage in the process of shale oil and shale gas exploration and production are matters of significant environmental concern in the US and have resulted in comprehensive Federal and State regulation, as well as extensive litigation.⁵⁰

Recent regulatory and policy initiatives in Australia

Policy developments over the last several years in relation to unconventional oil and gas in Australia have focused primarily on CSG and, in particular, access to private land to conduct CSG exploration and production, the impact of CSG activities on water resources, the use of BTEX chemicals in hydraulic fracturing and the disposal of saline water and salt. These developments are conveniently summarised in two recent papers.⁵¹

Commonwealth

In 2013, the Standing Council on Energy and Resources (SCER) endorsed and published a *National Harmonised Regulatory Framework for Natural Gas from Coal Seams* (Framework).⁵² The Framework identifies well integrity, water management

⁴⁶ See n 45.

⁴⁷ J Jenkins, 'Energy Facts: How Much Water Does Fracking for Shale Gas Consume?' *The Energy Collective* (6 April 2013) <<http://www.theenergycollective.com/jessejenkins/205481/friday-energy-facts-how-much-water-does-fracking-shale-gas-consume>>.

⁴⁸ See n 47.

⁴⁹ BTEX chemicals are benzene, toluene, ethylbenzene and xylene compounds.

⁵⁰ M Goldman, 'Drilling into Hydraulic Fracturing and Shale Gas Development: A Texas and Federal Environmental Perspective' (2012–13) 19 *Tex Wesleyan L Rev* 185.

⁵¹ Susan Robertson, 'Unconventional Gas – Legal Issues' [2012] *AMPLA Yearbook* 311, and K Brandon, 'Recent Developments in Unconventional Gas: A More Considered Regulatory Response?' [2014] *AMPLA Yearbook* 367.

⁵² Standing Council on Energy and Resources, 'National Harmonised Regulatory Framework for Natural Gas from Coal Seams' (May 2013) <<http://www.scer.gov.au/files/2013/09/National-Harmonised-Regulatory-Framework-for-Natural-Gas-from-Coal-Seams.pdf>>.

and monitoring, hydraulic fracturing and chemical use as the four key areas of operations which need to be regulated in order that the community can be assured as to the protection and management of underground and surface water resources and that CSG operations can coexist with other land use activities without harm to the environment or human health. The primary purpose of the Framework is to provide guidance for governments in formulating legislation to regulate CSG activities in a way that provides increased consistency, certainty and transparency and delivers the best possible balance of social, economic and environmental outcomes for Australia.

The Framework identifies 18 leading practices to mitigate the potential adverse impacts associated with the development of CSG and to build a robust national regulatory regime for the industry. In relation to *well integrity*, leading practices require that wells be designed, constructed, operated, maintained and decommissioned in accordance with practices and standards which are rigorously enforced so as to prevent the uncontrolled release of fluids, solids or gases into the environment over the full life cycle of the well. Leading practices in relation to *water management and monitoring* require evidenced-based decision-making to avoid depletion and contamination, which can adversely affect existing groundwater users, inter-aquifer connectivity, groundwater to surface water interactions and groundwater-dependent ecosystems. To make these decisions, regulators require baseline information and ongoing monitoring and the oversight of the Independent Expert Scientific Committee under the EPBC Act as mentioned below.

Leading practices in relation to *hydraulic fracturing* require a sound understanding of the geology, hydrology, hydrogeology and geo-mechanics and for that understanding to be applied in planning well stimulation by hydraulic fracturing activities. In order to identify and mitigate any health, safety or environmental risks, wells need to be monitored on an ongoing basis to assess the impacts of hydraulic fracturing and chemical use on water resources. The key leading practices in relation to *chemical use* are the selection of environmentally benign chemicals and compounds and comprehensive regulations and industry codes covering public health and safety, environment protection and the transport, handling, storage and disposal of chemicals.

Desirable as the guidance provided and the objectives of the Framework might be in relation to CSG, it is difficult to understand why it does not contain any reference to activities involving other types of unconventional oil and gas.

As noted above, a major Commonwealth initiative has been the establishment in 2012 of the Independent Expert Scientific Committee (IESC) as a statutory body under the EPBC Act to provide scientific advice to Commonwealth and State ministers on the water-related impacts of CSG and large coal mining development proposals as a precursor to the grant of necessary government approvals. The IESC also:

- provides scientific advice to the Commonwealth Environment Minister on research priorities and projects commissioned by the Minister and bioregional assessments being undertaken by the Australian Government; and
- publishes and disseminates scientific information about CSG and large coal mining activities on water resources.

As a result of proposals considered and advice given to date, the IESC has highlighted the need for regulators and project proponents to provide baseline information regarding the scale of developments in a regional context; development and application of

hydrological models; site water and salt balances; potentially significant impacts on water resources and water-related assets, including upstream, downstream, direct and indirect impacts; cumulative impacts from activities in the same catchment or region, and the effectiveness of ongoing monitoring, mitigation and management measures.⁵³ During the period from December 2012 to June 2014, the IESC assessed and provided advice on six CSG development proposals involving from 60 to 6,500 wells and covering areas of up to 8,000 square kilometres.⁵⁴ That advice is made public within ten days of being given to the relevant regulators.

The IESC has also published background reviews on aquifer connectivity within the Great Artesian Basin, and the Surat, Bowen and Galilee Basins; hydraulic fracturing ('fracking') techniques; co-produced water – risks to aquatic ecosystems; subsidence from coal seam gas extraction in Australia, and bore integrity.⁵⁵ Four priority areas for research projects have been identified, viz:

- Hydrology – better understanding and modelling of alterations to groundwater and surface water characteristics and processes.
- Ecosystems and water – strengthening knowledge of potential impacts on key species and ecosystems, as well as methods for monitoring and mitigating these impacts.
- Chemicals – chemical and ecotoxicological investigations including the potential cross-contamination of drinking water and other water resources.
- Cumulative impacts – assessing the impacts from individual coal seam gas or coal mining developments in conjunction with the impacts from other existing and likely developments in the region.⁵⁶

Given that all of the States have now entered into Bilateral Agreements with the Commonwealth and that the Northern Territory has entered into a Memorandum of Understanding with the Commonwealth committing to do so, it is anticipated that the number of development proposals referred to the IESC for review and advice will increase. But there is no present indication that the IESC's terms of reference will be expanded to include development proposals affecting unconventional oil and gas (other than CSG), nor as to when that might occur.

States and Territories

WESTERN AUSTRALIA

In 2011, the Western Australian Department of Mines and Petroleum (WADMP) commissioned a report to assess the capacity of the Petroleum and Geothermal Resources Act 1967 (WA) (in the Report referred to by the acronym PAGERA) to regulate shale gas exploration and production activities in the State. That Report⁵⁷ made 15 Recommendations, viz:

⁵³ Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development, 'Review of Activities – December 2012 – June 2014', available at [5 www.iesc.environment.gov.au/index.html](http://www.iesc.environment.gov.au/index.html).

⁵⁴ *Ibid.*

⁵⁵ *Ibid.*, available at www.iesc.environment.gov.au/research/index.html.

⁵⁶ *Ibid.*

⁵⁷ Dr T Hunter, 'Regulation of Shale, Coal Seam and Tight Gas Activities in Western Australia' (July 2011). See also, T Hunter, 'Shale Gas Resources in Western Australia: An Assessment of the Legal Framework for Extraction of Onshore Shale Gas' (2011) 18(2) *Murdoch University Electronic Journal of Law* 29.

Recommendation 1: The [WADMP] should develop a policy/strategy for the management of produced water from fracking processes. This strategy should be based on best practice, taking into account domestic and international experiences.

Recommendation 2: In implementing a management strategy for the production of shale gas, the [WADMP] should ensure a produced water management plan is integrated into the whole petroleum chain, including individual well abandonment and field abandonment.

Recommendation 3: The [WADMP] should provide full, transparent disclosure of all chemicals used in WA fracking operations. This disclosure should be made available on the WADMP website.

Recommendation 4: The [WADMP] address the issue of conflicting land use and land access in its management of shale gas operations throughout the whole petroleum chain. This should be addressed through

- (1) Legislative provisions contained within the PAGERA (objects clauses)
- (2) A pre-emptive land use management strategy developed in consultation with relevant stakeholders and communities.

Recommendation 5: The Schedule of Onshore Exploration and Production Requirements – 1991 should be amended to include the appropriate definition of ‘formation’ or the like to encompass shale gas formations yielding a gas.

Recommendation 6: The [WADMP] address the issue of field sterilisation use in its management of shale gas operations throughout the whole petroleum chain. The optimal recovery of resources should be included as an objects clause in the PAGERA.⁵⁸

Recommendation 7: The [WADMP] Safety Branch, in conjunction with the Petroleum Division, undertake an internal assessment of the Safety processes to ensure that there are complementarities and the current safety regulations apply across the petroleum chain for onshore shale gas activities.

Recommendation 8: The [WADMP] undertake to write environmental regulations to regulate onshore petroleum activities, including the recovery of coal seam gas. The creation of such regulations should be a priority to ensure enforceability of the Environmental Management Plan.⁵⁹

Recommendation 9: The [WADMP] undertake to plan for Succession, in the Resources Branch of the Petroleum Division, including the capture of the knowledge and experience of senior petroleum engineers, geologists and geophysicists.

Recommendation 10: The WADMP undertake to write resource regulations to regulate onshore petroleum activities, including coal seam gas.

Recommendation 11: The WADMP undertake to capture in written form well design, history and experience to ensure that this information is committed to corporate memory.

Recommendation 12: The WADMP ensure the inclusion of management of produced water from abandoned wells in the proposed Environment Regulations and Resource Management Regulations.

Recommendation 13: The PAGERA requires amendment to incorporate field abandonment. The requirements for field abandonment should also be incorporated into the proposed Environment Regulations and Resource Management Regulations.

⁵⁸ This Recommendation appears to overlook the powers of the Minister under s 68 of the PAGERA.
⁵⁹ Clause 114(3) of the Schedule of Onshore Exploration and Production Requirements – 1991 requires the operator to have an approved code of environmental practice relevant to the area of operations.

Recommendation 14: The WADMP develop a standard Petroleum and Land Access process overview for the abandonment of a field.

Recommendation 15: The WADMP should maintain vigilance in the processes, standards and number of applications in relation to shale gas extraction to ensure that a LNG Enforcement Unit is established if required.

Certain of the Recommendations have curious aspects. A number of them seem to be directed to the management and administration of the WADMP, rather than to the regulatory inadequacies of the provisions of the PAGERA; some refer specifically to shale gas and others to CSG, but tight gas is not mentioned; and the Recommendations which focus on water management refer to produced water associated with shale gas and ‘fracking’, rather than the issues associated with the de-watering of CSG wells to relieve pressure and allow the CSG to flow from coal seams. Be that as it may, the WADMP agreed with substantially all of the Recommendations,⁶⁰ resulting in the promulgation of the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 (WA), the Petroleum (Submerged Lands) (Environment) Regulations 2012 (WA) and the Petroleum Pipelines (Environment) Regulations 2012 (WA) as well as the publication of the Guidelines for the Preparation and Submission of an Environment Plan.⁶¹

The Regulations and Guidelines provide for the approval by the Minister of an *environment plan* prior to commencement of any *petroleum activity*. The environment plan must demonstrate that the petroleum activity will be carried out in a manner not only consistent with the principles of economically sustainable development, but which will reduce to as low as is reasonably practicable the *environmental impacts* and *environmental risks* of the petroleum activity; it must have *environmental performance objectives* and *environmental performance standards*,⁶² and it must have appropriate measurement criteria for determining whether those objectives and standards have been met.

While neither the Regulations nor the Guidelines make any specific reference to unconventional oil or gas, Regulation 15(8) and (9) are in the following terms:

- (8) If the petroleum activity may involve the injection or re-injection of produced formation water⁶³ into wells, the implementation strategy must specify the maximum permissible concentration of petroleum in that produced formation water.⁶⁴
- (9) The implementation strategy must include details of any chemicals or other substances that may be –
 - (a) in, or added to, any treatment fluids to be used for the purposes of drilling or hydraulic fracturing undertaken in the course of the petroleum activity; or
 - (a) otherwise introduced into a well, reservoir or subsurface formation in the course of the petroleum activity.

⁶⁰ Department of Mines and Petroleum, ‘Response to Report: “Regulation of Shale, Coal Seam and Tight Gas Activities in Western Australia”’ (31 October 2011).

⁶¹ As amended 28 August 2012.

⁶² The terms in italics are defined in clause 4 of the Regulations.

⁶³ *Produced formation water* is defined in clause 4 to mean ‘natural aqueous fluid recovered from a petroleum reservoir in association with petroleum’. In the context of unconventional oil and gas, note the use of the term ‘petroleum reservoir’ in the definition.

⁶⁴ Clause 33 creates offences relating to the discharge, injection or re-injection of produced formation water with petroleum in excess of specified concentrations and clause 34 creates offences related to failure to monitor and report on emissions and discharges.

In August 2013, the Western Australian Parliamentary Committee on Environment and Public Affairs initiated an Inquiry into the Implications of Hydraulic Fracturing for Unconventional Gas, with particular emphasis on the impact of hydraulic fracturing on current and future land; the regulation of chemicals used in hydraulic fracturing; the use and potential recycling of groundwater used in hydraulic fracturing, and the rehabilitation of land that has been hydraulically fractured. As at the date of writing, the Committee is yet to report.

On 5 February 2014, the WADMP released for stakeholder comment discussion drafts of the Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2014 (WA)⁶⁵ and the Guidelines for the Petroleum and Geothermal Energy (Resource Management and Administration) Regulations, 2014 (WA). The Regulations are modelled upon the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 (Cth), but neither set of Regulations has regard to the differences between conventional and unconventional oil and gas. They continue frame approval and reporting requirements in the language of conventional oil and gas by the use of terms such as recoverable petroleum in the pool, petroleum pools in a field, the rate of recovery of petroleum from the petroleum pool, etc. This is enforced in the Guidelines where, for example, the objective of a field development plan is explained in the following terms:

A key tenet of good oil field practice is resource management. Resource management ensures that the production of crude oil or raw gas is at a rate that can be sustained without adversely affecting the petroleum reservoir and avoiding unnecessary loss of associated resources. Petroleum should be produced at a maximum efficiency rate, which is the maximum rate at which oil or gas can be produced without excessive decline or loss of reservoir energy.⁶⁶

At the same time as it released the draft Regulations and Guidelines, the WADMP published *Natural Gas from Shale and Tight Rocks – An Overview of Western Australia’s Regulatory Framework*.⁶⁷ The Report notes that, since 1958, more than 780 wells have been hydraulically fractured in Western Australia, most of which were conventional oil and gas wells on Barrow Island, offshore Western Australia. Hydraulic fracturing fluid typically contains 90 per cent water, 9.5 per cent sand (or equivalent material) and 0.5 per cent chemicals, the latter being introduced ‘to improve the transportation of the sand, reduce friction, prevent the growth of bacteria, reduce chemical precipitation and prevent corrosion over time’.⁶⁸ The Report also notes that the chemicals used in a well must be approved, with the assessment being based on their toxicity, and information regarding their use made public.⁶⁹

As noted in the Introduction, the Basin in Western Australia most likely to contain substantial quantities of unconventional gas and oil is the Canning Basin in the Kimberley District. Buru Energy Limited and Mitsubishi Corporation, in joint venture,

⁶⁵ Following review of the public and stakeholders’ consultation comments in respect of these draft onshore Regulations, on 4 February 2014 the WADMP issued for public comment a draft of the Petroleum (Submerged Lands) (Resource Management and Administration) Regulations 2014 (WA) in respect of the offshore areas and a draft Guideline for Baseline Groundwater Monitoring for the onshore petroleum.

⁶⁶ Paragraph 4.1 of the Guidelines, at 8.

⁶⁷ February 2014, www.dmp.wa.gov.au/shaleandtightgas.

⁶⁸ *Ibid.*, 8.

⁶⁹ *Ibid.*, 9.

hold petroleum tenements covering a large percentage of the area in the Canning Basin. On 7 November 2012, the Joint Venture entered into an Agreement with the State of Western Australia pursuant to which it was granted significant concessions from the regulatory conditions applicable to petroleum tenements on the basis that, if the Joint Venturers were to prove up sufficient gas reserves to underpin a technically and economically viable domestic gas project which in the opinion of the Joint Venturers can be established and sustained, some of that gas would be made available for sale in the domestic market. To date, the Joint Venture has not 'booked' any gas reserves. Aspects of the Agreement and the ratifying legislation, as well as the difficulties inherent in bringing shale gas from the remote Canning Basin to domestic customers, have been canvassed elsewhere.⁷⁰

In 2014, Buru Energy Limited, as operator of the Joint Venture, announced its intention to drill and hydraulically fracture four wells as part of the Laurel Formation Tight Gas Exploration Program. The Program envisaged 'fracking' 32 times in the four wells, using 31 megalitres of water. The Environmental Protection Authority of Western Australia determined that 'Buru Energy's small scale, limited duration "proof of concept" exploration proposal is unlikely to have a significant effect on the environment' and, in June 2014, both the Environment Minister and the WADMP gave approval for the Program to proceed.⁷¹ While the proposed 'fracking' operations were approved by the Yungngora indigenous community in respect of one of the proposed wells to be drilled on Nookanbah Station, the Yawuru indigenous community objected to the 'fracking' of the two wells proposed to be drilled at Yulleroo unless Buru Energy Limited agreed 'to meet environmental, cultural, social and economic conditions set by Yawuru'.⁷² As a consequence, Buru Energy Limited announced on 3 December 2014, that the 'fracking' of the two wells at Yulleroo would be deferred until after the wet season in 2015.

SOUTH AUSTRALIA

In December 2012, the South Australian Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) published *Roadmap for Unconventional Gas Projects in South Australia* (Roadmap).⁷³

The Roadmap claims that the Petroleum and Geothermal Energy Act 2000 (SA) (PGEA), which was proclaimed on 1 October 2009, has a number of aspects that are considered an advantage without precedent in other Australian legislation. In particular, the PGEA allows DMITRE to adopt a one-stop shop or lead agency approach by identifying, considering, and appropriately addressing through the environmental assessment and approval provisions of the PGEA the potential impacts on all natural, social and economic aspects of the environment.⁷⁴ The PGEA is said to have been developed on the basis of six principles for regulatory best practice, viz: certainty;

⁷⁰ D Maloney, 'Natural Gas (Canning Basin Joint Venture) Act' (2013) 32 ARELJ 127; cf J Chandler, 'Shale Gas and Government Agreements in Western Australia' (2014) 33 ARELJ 44.

⁷¹ Western Australian Environmental Protection Authority, 'Public Advice Under Section 39A(7), Environmental Protection Act 1986, Laurel Formation Tight Gas Pilot Exploration Program (Buru Energy Limited)' (13 January 2014) 2 <http://www.epa.wa.gov.au/News/Publicadvice/Documents/s38%20Laurel_13-404315.pdf>.

⁷² Yawuru Community, 'Yawuru members make decision about fracking at Yulleroo' <<http://www.yawuru.com/yawuru-members-make-decision-fracking-yulleroo/>>

⁷³ See http://www.petroleum.dmitre.sa.gov.au/_data/assets/pdf_file/0008/179621/Roadmap_Unconventional_Gas_Projects_SA_12-12-12_web.pdf.

⁷⁴ Roadmap, at 134.

openness; transparency; flexibility; practicality and efficiency.⁷⁵ The PGEA mandates early public participation and engagement leading to government approval of a Statement of Environmental Objectives (SEO) in relation to each proposed activity, with the proponent being required to prepare an Environmental Impact Report describing any potentially significant risk associated with the activity. The SEO is a regulatory instrument which, although approved under the PGEA, incorporates into the Energy Resources Division's approval and compliance monitoring processes the requirements of other State environmental and work, health and safety legislation.

Despite these glowing assessments, the Roadmap sets out 125 Recommendations for improving unconventional gas projects in South Australia. Although many of the Recommendations are duplicative or overlap in part, at least 35 of them would require amendment of the PGEA or the PGEA Regulations. Seven working groups have been established to implement the Recommendations by conducting industry and stakeholder workshops and public consultations.

Since 1969, over 700 hundred wells have been safely stimulated by hydraulic fracturing in South Australia. These operations have predominantly been conducted in conventional well at depths far greater than the potable water aquifers.⁷⁶

On 24 September 2014, The Hon MC Parnell MLC introduced in the South Australian Legislative Council the Petroleum and Geothermal Energy (Hydraulic Fracturing) Amendment Bill 2014 (SA). The Bill would have banned hydraulic fracturing for a period of two years, during which period the Minister would have been required to cause a report to be completed and tabled in Parliament on the possible impact of hydraulic fracturing operations on water quality, soil health, climate change and local economies. The Bill failed to be adopted by the Legislative Council.

Currently, the South Australian Parliament's Natural Resource Committee is conducting an inquiry into the possible impact of fracture stimulation in unconventional gas operations. The Treasurer and Minister for Mineral Resources and Energy, The Hon Tom Koutsantonis MLA, released the Southern Australian Government's Submission to the Committee on 23 February 2015.⁷⁷ The key conclusions in the submission include the following.

Potential risks of groundwater contamination: As noted above, based on current technology and unequivocal geological data (including thousands of metres of sealing rock between these aquifers and the potential petroleum reservoir fracture stimulation targets), the risk of fracture propagation at depths below 2,500 metres leading to fracture stimulation fluids contaminating shallow aquifers is unrealistic.⁷⁸

Chemicals used in fracture stimulation: A comprehensive on-site chemical safety management plan (addressing transport, storage, use and waste) is required to be approved by the regulators before any proposed fracture stimulation would be approved to prevent impacts to workers, the public and the environment. This would include consideration of all chemicals to be used and the potential cumulative toxicity, as for the use of potentially hazardous substances by any industry.⁷⁹

⁷⁵ *Ibid*, 136.

⁷⁶ Energy Resources Division, 'Frequently Asked Questions – Unconventional Gas in South Australia' (updated 14 July 2014).

⁷⁷ Submission from the South Australian Government dated January 2015 to the Inquiry into Unconventional Gas (Fracking).

⁷⁸ *Ibid*, 16.

⁷⁹ *Ibid*, 18.

Prior to any well operations being approved by government authorities, appropriate baseline studies are required in South Australia to be undertaken to determine the level of existing contaminants in the aquifers so that contamination by the well operation can be detected.⁸⁰

Wastewater disposal: Wastewater disposal is regulated to avoid the following potential risks associated with all industrial and domestic activities, including oil and gas operations:

- discharge of contaminated waters into waterways;
- delivery to unsuitable treatment works;
- spills due to improper surface handling of wastewater; and
- salt waste – a by-product of water treatment and salt recovery processes – that may also create a concentrated salt waste stream, which can present an important waste disposal issue, particularly in arid landscapes that are already sensitive to salt load.⁸¹

Effectiveness of existing legislation and regulation: If a company proposes to undertake fracture stimulation, under the PGEA, a comprehensive and extensive public consultation process is required to be undertaken, demonstrating how all potential risks to social, natural and economic environments can be managed to meet community expectations for net outcomes. This of course includes the management of potential risks to water resources ... It is an offence under several Acts in South Australia for any activities, including fracture stimulation operations, to cause aquifer contamination and have an adverse impact on potentially affected people, the natural ecosystems or enterprises. The significant penalties associated with these provisions provide strong drivers for industry to prevent and avoid any contamination, regardless of the PGEA approval process.⁸²

While it remains to be seen whether the current Parliamentary Inquiry into fracture stimulation in unconventional gas operations will make any recommendations for legislative changes, the fact that hydraulic fracturing has been used without major incident in South Australia in over 700 wells (substantially all of which would have been conventional wells) since 1969 suggests that a complete ban is unlikely, particularly given the Government's robust defence of the adequacy of the existing regulatory regime in its Submission to the Inquiry.

However, again is left to ponder why the Inquiry is limited to unconventional gas.

VICTORIA

On 24 August 2012, the Victorian Government announced that the following reforms would take immediate effect:

- a hold on approvals to undertake hydraulic fracturing ('fracking') as part of onshore gas exploration and a hold on the issuing of new exploration licences for coal seam gas until the upcoming national framework proposals have been released; and
- a ban on the use of BTEX chemicals (benzene, toluene, ethylbenzene and xylene) in hydraulic fracturing in Victoria.⁸³

⁸⁰ *Ibid.*, 19.

⁸¹ *Ibid.*, 27.

⁸² *Ibid.*, 28, 29.

⁸³ Media Release dated 24 August 2012 by The Hon Michael O'Brien MP, Minister for Energy and Resources.

The Media Release noted that, while there was no CSG production in Victoria and exploration was at an early stage, the location of coal resources there is well known, but the amount of associated gas and the feasibility of extraction are uncertain.

In December 2012, a Gas Market Taskforce was established to provide policy options to the Victorian Government for improving the operation and efficiency of the east coast Australian gas market and increasing gas supplies in the short to medium term. The Taskforce's Final Report, which included 19 Recommendations, was presented to the Government in October 2013. The principal recommendations were to remove the moratorium on the grant of new exploration licences and to lift the ban on hydraulic fracturing, subject to the adoption of reforms to ensure leading practice regulation, community engagement, water management, monitoring, baseline assessments and licensing, and the highest environmental and safety standards for hydraulic fracturing operations. There was also a Recommendation that the National Harmonised Regulatory Framework be reviewed to identify its applicability 'for other types of unconventional gas, including tight and shale gas, and address any other gaps'.⁸⁴

Despite the Taskforce's Recommendations, on 28 May 2014 the Victorian Government announced that not only would the existing moratorium on the grant of further exploration licences for CSG and the ban on hydraulic fracturing continue, but it would also be extended to the approval of work plans under existing exploration licences, pending the receipt of further information, 'including evidence from the water study, community views, and industry impacts'.⁸⁵ A report for the Victorian Government was in the course of being prepared for release by July 2015, which would have been the earliest date by which the moratorium would have ended. However, that process was 'de-railed' by a change of Government in November 2014.

In the meantime, the ban on the use of BTEX chemicals in Victoria was given legislative effect by section 69 of the Resources Legislation Amendment (BTEX Prohibition and Other Matters) Act 2014 (Vic). That section added section 101A of the Petroleum Act 1998 (Vic); section 101A is set out in the Schedule. The Act also introduced a similar provision into other Victorian energy and resources legislation.⁸⁶

On 28 January 2015, the new Victorian Government honoured an election commitment by announcing a Parliamentary Inquiry into CSG exploration in Victoria and a continuance of the current moratorium and bans until the findings of that Inquiry are released. Press and industry speculation is that this may not occur until 2016.

In announcing the Inquiry, the Minister for Energy and Resources, The Hon Lily D'Ambrosio, dismissed the work of the Gas Market Taskforce as 'a secret inquiry' which had 'locked out members of the community' and had 'failed to interrogate the science'.⁸⁷ The Terms of Reference for the Parliamentary Inquiry are yet to be released, but indications are that the focus will again be on CSG rather than all forms of unconventional oil and gas.

⁸⁴ Victorian Gas Market Taskforce, *Gas Market Taskforce Final Report and Recommendations* (October 2013) 6 <http://www.energyandresources.vic.gov.au/_data/assets/pdf_file/0003/1143417/Victorian-Gas-Market-Taskforce-Final-Report-October-2013.pdf>

⁸⁵ Media Release dated 28 May 2014 by The Hon Russell Northe MP, Minister for Energy & Resources.

⁸⁶ See s 63B of the Geothermal Energy Resources Act 2005 (Vic); s 158A of the Greenhouse Gas Geological Sequestration Act 2008 (Vic); and s 26(4A) of the Mineral Resources (Sustainable Development) Act 1990 (Vic).

⁸⁷ Joint Announcement dated 28 January 2015 of a Parliamentary Inquiry by the Premier, The Hon Daniel Andrews MP, and the Minister for Energy and Resources, The Hon Lily D'Ambrosio MP.

NEW SOUTH WALES

Over the last four years, the New South Wales Government has instituted a plethora of moratoria, bans, community and industry consultations, experts' reports, peer reviews and the like, all driven by growing concerns from stakeholders regarding CSG operations, aquifer contamination from loss of well integrity, hydraulic fracturing and fugitive emissions, as well as a national 'Lock the Gates' campaign by farmers to deprive CSG companies of access to their lands. Given the limited extent to which hydraulic fracturing has been used in CSG wells in New South Wales,⁸⁸ this response suggests overreach on the government's part. However, the unhappy coincidence is that the relevant coal seams predominantly underlie prime agricultural land used for horse and cattle breeding as well as viticulture and wine production.

On 19 December 2010, the Premier of New South Wales announced the introduction of 'tough new rules for coal seam gas exploration licences' requiring forward work plans for exploration programmes detailing any expected environmental impacts, the review of environmental factors (including hydraulic fracturing) by the Department of Environment, Climate Change and Water and the Department of Planning, the disclosure of chemical additives proposed to be used and community consultations and information. The announcement also foreshadowed examination of the banning of the use of BTEX chemicals 'in situations which may pose a risk to groundwater'.⁸⁹

The 'tough new rules' had little opportunity to take effect before, on 26 March 2011, the Government changed hands. On 20 May 2011, the new Government announced a moratorium of 60 days on the use of hydraulic fracturing and the grant of new petroleum exploration licences for CSG in New South Wales to allow for consultations regarding community concerns.⁹⁰ The outcomes of those consultations resulted in the following measures, which were announced on 21 July 2011:⁹¹

- a resumption of applications for and the grant of coal and CSG exploration licences;
- a ban on the use of BTEX chemicals as additives during CSG drilling;
- an extension of the moratorium on hydraulic fracturing until 31 December 2011;
- a regulation that requires holding water access licence in order to extract more than three megalitres per year from groundwater sources;
- a ban on the use of evaporation ponds in CSG operations; and
- the adoption of new public consultation guidelines to increase transparency and accountability.

On 2 December 2011, the Government extended the moratorium on hydraulic fracturing from 31 December 2011 to April 2012 to allow for consultation with industry experts regarding strengthening the standards for hydraulic fracturing and CSG well integrity to ensure all activity is contained within the well so as to prevent the potential

⁸⁸ See n 45.

⁸⁹ News Release dated 19 December 2010 by the Premier, The Hon Kristine Kenneally MP.

⁹⁰ Media Release dated 20 May 2011 by the Minister for Planning, The Hon Brad Hazzard MP.

⁹¹ Media Release dated 21 July 2011 by the Minister for Resources and Energy, The Hon Chris Hartcher MP.

escape of any gases or liquids. The recommendations of the industry experts were to be peer reviewed by the New South Wales Chief Scientist and Engineer.⁹²

Draft Codes of Practice for CSG, covering well integrity standards and fracture stimulation activities, and new Community Consultation Guidelines were released on 6 March 2012,⁹³ followed on 11 September 2012 by a Strategic Regional Land Use Policy designed to provide greater protection for farmers with prime agricultural land, to protect water resources and to balance better competing land uses.⁹⁴ The Policy requires that proposed projects in relation to strategic agricultural land are the subject of an agricultural impact statement and a 'gateway process' of assessment by an independent scientific panel to determine the likely impact of CSG operations. Further, an aquifer interference policy is incorporated for the assessment and protection of water resources and CSG exclusion zones are declared in respect of residential land in all 152 council areas across New South Wales. Under the Code of Practice incorporated in the Policy, fracture stimulation activities require a management plan approved by the Resources and Energy Division of the Department of Trade and Investment and which incorporates modelling in respect of fracture growth, risk assessment and management controls, a safety management plan, identification of the chemicals (including concentrations and volumes) to be used in fracture stimulation, water quality assessment and monitoring, and a plan for the management, reuse, recycling, treatment, storage and disposal of flow-back water. Again, these requirements are directed at CSG and coal mining operations, rather than other forms of unconventional oil and gas.

In February 2013 and in a climate of enhanced community concerns regarding CSG activities, the Premier requested the Chief Scientist and Engineer of New South Wales to conduct an independent review of CSG activities in New South Wales, with a preliminary report of findings and observations to be provided by July 2013. With gas resources being committed to the LNG projects in Queensland, rising gas and electricity prices generating outcry from constituents and the expiration of long-term supply agreements delivering gas into the New South Wales, the Government needed a solution which would allow CSG exploration and production in New South Wales to continue without alienating the increasingly vocal electorate.

In October 2013, the Government amended section 9A of The State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Policy 2007 (NSW) so as to:

- include all existing residential developments in a CSG exclusion zone, which proscribe any new CSG activity within two kilometres of a residential development;
- include 1.74 million hectares of strategic agricultural land in the Upper Hunter and New England North West regions in the CSG exclusion zone, and to require any CSG activities affecting that land to be subject to the gateway process of assessment; and
- appoint the members of the Mining and Petroleum Gateway Panel.

⁹² Media Release dated 2 December 2011 by the Minister for Resources and Energy, The Hon Chris Hartcher MP.

⁹³ Media Release dated 6 March 2012 by the Minister for Resources and Energy, The Hon Chris Hartcher MP. The Codes were issued in final form in September 2012.

⁹⁴ Media Release dated 11 September 2012 by the Deputy Premier, The Hon Andrew Stoner MP, and the Minister for Planning and Infrastructure, The Hon Brad Hazzard MP.

On 28 January 2014, the CSG exclusion zones were expanded to include land the subject of Critical Industry Clusters and future residential zones and growth areas, so that 2.7 million hectares of New South Wales are now within CSG exclusion zones.⁹⁵

The Chief Scientist's Final Report was presented on 30 September 2014 and concluded that

the technical challenges and risks posed by the CSG industry can in general be managed through:

- careful designation of areas appropriate in geological and land-use terms for CSG extraction
- high standards of engineering and professionalism in CSG companies
- creation of a State Whole-of-Environment Data Repository so that data from CSG industry operations can be interrogated as needed and in the context of the wider environment
- comprehensive monitoring of CSG operations with ongoing automatic scrutiny of the resulting data
- a well-trained and certified workforce, and
- application of new technology developments as they become available.

All of the above need to take place, according to the Chief Scientist, within a clear legislative framework which is supported by an effective and transparent reporting and compliance regime and by drawing on appropriate expert advice.⁹⁶

Meanwhile, on 26 March 2014 the Government announced a freeze on the processing of applications for petroleum exploration licences and petroleum special prospecting authorities until 26 September 2014 and an audit of existing petroleum exploration licences. To discourage further applications, the application fee for a petroleum exploration fee was increased from \$1,000 to \$50,000.⁹⁷ On 25 September 2014, this freeze was extended to 26 September 2015.⁹⁸

The NSW Gas Plan⁹⁹ was released on 20 November 2014 following adoption by the Government of all of the recommendations in the Chief Scientist's Final Report. The strategies embodied in the plan are to put further CSG activities on hold pending receipt or better science and information to deliver world best practice regulation and, following adoption of the regulations, to take measures to secure New South Wales' gas supply needs.

By the Petroleum (Onshore) Amendment (NSW Gas Plan) Act¹⁰⁰ 2014 (NSW), ten pending applications for petroleum exploration licences and six pending applications for petroleum special prospecting applications were expunged without

⁹⁵ Media Release dated 28 January 2014 by the Deputy Premier, The Hon Anthony Stoner MP, the Minister for Planning, The Hon Brad Hazzard MP, and the Minister for Resources and Energy, The Hon Anthony Roberts MP.

⁹⁶ Chief Scientist & Engineer, *Final Report of the Independent Review of Coal Seam Gas Activities* (September 2014) iv.

⁹⁷ Media Release dated 28 March 2014 by the Minister for Resources and Energy, The Hon Anthony Roberts MP.

⁹⁸ Media Release dated 25 September 2014 by the Minister for Resources and Energy, The Hon Anthony Roberts MP.

⁹⁹ 'NSW Gas Plan – Protecting What's Valuable, Securing Our Future', Media Releases dated 13 and 20 November 2014 by the Deputy Premier, The Hon Troy Grant MP, and the Minister for Energy and Resources, The Hon Anthony Roberts MP.

¹⁰⁰ The Act came into effect on 28 November 2014.

compensation.¹⁰¹ Under Action 4 of the NSW Gas Plan¹⁰² the holders of existing petroleum exploration licences are given a ‘one-off’ opportunity to sell their licences back to the Government for limited compensation. The licences are then cancelled. Several companies have recently availed themselves of this option;¹⁰³ and others have seen pending applications for petroleum exploration licences refused on the basis that the information provided in support of the applications was unsatisfactory.¹⁰⁴ The net effect of these government interventions is said to be that the area of New South Wales available for petroleum exploration has been reduced from nearly 50 per cent to 11.2 per cent.¹⁰⁵

As recently as June 2015, the Deputy Premier and Leader of the National Party, The Hon Troy Grant MP, called for the Northern Rivers District of New South Wales to be declared CSG-free and for the government to buy back all current petroleum exploration licences in the District. On 24 April 2015, the Supreme Court of New South Wales¹⁰⁶ declared invalid a decision by the Government to suspend certain drilling operations on Petroleum Exploration Licence No 16, which is held by Metgasco Limited. Metgasco is a principal proponent of CSG operations in the District and has spent in excess of \$100m on exploration operations to date.

QUEENSLAND

In January 2015, it was reported that 1573 CSG wells had been drilled in Queensland during the period 2012–14, being 32 exploration wells, 132 appraisal wells, 1,394 development wells and 15 injection wells, and that CSG production in 2013–14 was 285 PJ and 2P CSG reserves as at 30 June 2014 were 42,020 PJ.¹⁰⁷ Most of Queensland’s CSG is currently produced from the Fairview and Spring Gully areas in the Bowen Basin, where development has been concentrated on coal seams at around 300 metres depth, and the Walloon Coal Measures in the Surat Basin, where CSG is typically obtained from coal seams located at depths between 300 and 600 metres.

As noted above,¹⁰⁸ it has been forecast that there will be up to 40,000 CSG wells drilled in Queensland over the next 20 years, so the de-watering of CSG wells, associated salt production and/or salinity and the impact on water resources are issues of primary community concern.¹⁰⁹

¹⁰¹ An applicant for an expunged application must be invited to make a new application before the Minister may take any fresh title action in respect of the area the subject of the expunged application.

¹⁰² NSW Government, NSW Gas Plan: Protecting what’s valuable, Securing our future 10 <http://www.resourcesandenergy.nsw.gov.au/_data/assets/pdf_file/0005/534830/NSW-Gas-Plan.pdf>

¹⁰³ AGL Energy Limited, in respect of PEL 5; Dart Energy limited in respect of PEL 459, PEL 460, PEL 463 and PEL 464; Pangea Resources Pty Ltd in respect of PEL 436 and PEL 476 and Apex Energy NL in respect of PEL 442, PEL 444 and PEL 454, all of which transactions have occurred in March 2015, with the most recent cancellations being announced on 16 March 2015.

¹⁰⁴ Media Release dated 20 August 2014 by the Minister for Resources and Energy, The Hon Anthony Roberts MP, in relation to application made by CEEMAC Pty Ltd for PELs 158, 159 and 160.

¹⁰⁵ Peter Hannam, ‘Buybacks cancel Sydney CSG licences’ *The Sydney Morning Herald* (17 March 2015) 7.

¹⁰⁶ *M Limited v Minister for Resources and Energy* [2015] NSWSC 453.

¹⁰⁷ Department of Natural Resources and Mines, Queensland, *Queensland’s Petroleum and Coal Seam Gas 2013–2014* (January 2015).

¹⁰⁸ See n 53.

¹⁰⁹ A Smith, ‘Adapting the Onshore Joint Operating Agreement for Unconventional Gas Operations’ [2014] *AMPLA Yearbook* 345.

Given the extensive CSG exploration and development in Queensland, it is not surprising that considerable legislative attention has been given to the interaction between CSG activities, the management of water resources and environmental protection. In October 2008, the Government released the Queensland Coal Seam Gas Water Management Policy which banned the use of evaporation dams or ponds as the primary of disposal of water produced in de-watering CSG wells; required existing evaporation dams to be remediated within three years; imposed responsibility for the treatment and disposal of CSG water on the CSG producers; and required CSG water management plans to be incorporated in the environmental management plans to be filed in support of applications for environmental approval of large-scale CSG projects.

The ban on evaporation dams was given legislative effect by the insertion of Parts 4 and 15 of the Environmental Protection Act 1994 (Qld) on 1 July 2010.¹¹⁰ Part 4 stipulates that an environmental management plan for a CSG environmental authority must not provide for using a CSG evaporation dam unless the plan includes an evaluation of best practice environmental management for managing the CSG water and of alternative ways of managing the water, and the evaluation shows there is no feasible alternative to a CSG evaporation dam for managing the water.¹¹¹

The Environmental Protection Act was further amended on 1 December 2010 by the insertion of section 312W,¹¹² which provides that environmental authorities granted in respect of CSG and unconventional oil and gas activities are taken to include a condition prohibiting the use of BTEX chemicals and chemicals that produce, or are likely to produce, BTEX chemicals. Section 312W of the Environmental Protection Act was repealed by section 7 of the Environmental Protection (Greentape Reduction) and Other Legislation Amendment Act 2012 (Qld) (Greentape Act), but reinserted by section 8 of the same Act as section 206 of the Environmental Protection Act. The ban on the use of BTEX chemicals and chemicals that produce, or are likely to produce, BTEX chemicals is deemed by section 206 to be a condition of every environmental authority granted in respect of a resource activity.¹¹³

The Petroleum and Other Legislation Amendment Regulation 2011 (Qld) introduced the requirements for holders of tenures under the Petroleum Act 1923 (Qld) and the Petroleum and Gas (Production and Safety) Act 2004 (Qld) to give to each owner and each occupier of land on which the relevant activities are to be carried out at least ten business days' notice prior to commencement of drilling a well and prior to starting hydraulic fracturing activities, as well as notice of completion of the hydraulic fracturing activities within ten business days of such completion.¹¹⁴ The notice of completion must name the operator and contractor involved and provide details of the composition of hydraulic fracturing fluid pumped into the well for the hydraulic fracturing activities. Within two months of completing the hydraulic fracturing activities, the holder must lodge a hydraulic fracturing activities report providing comprehensive details of those activities, including each geological interval over which the activities were carried out, the volume and type of chemicals used, the maximum surface treatment pressure reached during each stage, the total volume of

¹¹⁰ See ss 34–40 of the South-East Queensland Water (Distribution and Retail Restructuring) and Other Legislative Amendment Act 2010 (Qld).

¹¹¹ Section 310D(6) of the Environmental Protection Act.

¹¹² Section 16 of the Natural Resources and Other Legislative Amendment Act (No 2) 2010 (Qld).

¹¹³ See s 107 of the Environmental Protection Act.

¹¹⁴ Sections 15A, 20 and 20A of the Petroleum Regulation 2004 (Qld) and ss 30, 35 and 35A of the Petroleum and Gas (Production and Safety) Regulation 2004.

hydraulic fracturing fluid pumped into each well and details of serious or material environmental harm caused by the activities.¹¹⁵ The report must be accompanied by a hydraulic fracturing fluid statement stating the quantity of each component of the fluid; the concentration of each component in the fluid and the name of any chemical compound in the fluid.¹¹⁶ Reports on hydraulic fracturing activities are kept confidential for a period of five years.¹¹⁷

The principal policy objective of the Greentape Act was to simplify the process for licensing environmentally relevant activities (ERAs) by creating a single approval process for environmental authorities.¹¹⁸ This is achieved by the insertion of Chapters 5 and 5A into the Environmental Protection Act. Depending on the perceived level of risk which ERAs pose to the environment, applications for environmental authorities may be the subject of a standard application,¹¹⁹ a variation application,¹²⁰ or a site-specific application.¹²¹ In the case of a standard application, there are standard conditions which will apply to each environmental authority and, if the operator meets the eligibility criteria, the authority will be granted automatically without the requirement for an assessment process. Where the operator is unable to satisfy all the standard conditions, an application to vary the relevant conditions may be made and the assessment will take place on the basis of the requested variations only. If the standard conditions do not apply, a site-specific application must be made. Site-specific applications are also required in respect of ineligible ERAs.¹²²

As part of the amendments to which effect was given by the Greentape Act, the information required by section 310D(5) and (6)¹²³ of the Environmental Protection Act in relation to environmental management plans is now required by section 126 of that Act in relation to site-specific applications for CSG activities. Section 309 of the Environmental Protection Act requires the holder of an environmental authority to include in its annual return to the administering authority an evaluation of the effectiveness of the management of CSG water under the criteria mentioned in section 126 (1)(e); of whether or not the CSG water has been effectively managed having regard to the criteria and, if not, what further action will be taken, and when it will be taken, to ensure the CSG water will in the future be effectively managed. The annual evaluation is intended to assist the administering authority in identifying necessary changes to the management of CSG water, which can be implemented by amendment of the conditions subject to which the environmental authority was granted.

115 Section 30A(3) of the Petroleum Regulation and s 46A(3) of the Petroleum and Gas (Production and Safety) Regulation.

116 Section 30A(4) of the Petroleum Regulation and s 46A(4) of the Petroleum and Gas (Production and Safety) Regulation.

117 Section 35(2)(i) of the Petroleum Regulation and s 51(2)(i) of the Petroleum and Gas (Production and Safety) Regulation.

118 The approval process adopts a structure similar to the assessment process stages in relation to development permits under the Sustainable Planning Act 1990 (Qld). Note that, in the event of conflicts between the conditions of an environmental authority and those of a development permit, s 420 of the Environmental Protection Act allows the Minister responsible for administration of the Sustainable Planning Act 2009 (Qld) to resolve the conflict.

119 Section 122 of the Environmental Protection Act.

120 Section 123 of the Environmental Protection Act.

121 Section 124 of the Environmental Protection Act.

122 An ERA is an *ineligible ERA* if it relates to a project declared under s 26 of the State Development and Public Works Organisation Act 1971 (Qld) to be a *significant project*.

123 In relation to evaporation dams, see n 115 and n 116.

With the ban on the use of evaporation dams, the preferred method of dealing with CSG water has been treatment using reverse osmosis plants to produce potable water. However, the legacy of that treatment is large quantities of salt, for which a use or satisfactory means of disposal must be found. This issue will, no doubt, engage the attention of the IESC when it is called upon to provide advice as required by the EPBC Act.

Documentation submitted as part of an environmental impact statement automatically forms part of the application for an environmental authority and a separate environmental management plan is no longer required. All environmental conditions applicable to a project are set out in the environmental authority. Conditions may include an environmental offset condition, where the administering authority is satisfied that the applicant has demonstrated that all cost-effective on-site measures to avoid and/or minimise any negative impacts of the development on the natural environment are being, or will be, carried out, and conditions relating to access to land; rehabilitating and remediating environmental harm resulting from the relevant activity; and the prevention of environmental harm because of the relevant activity.¹²⁴

The Greentape Act also amends the Environmental Protection Act¹²⁵ to require a plan of operations in respect of petroleum activities under a petroleum lease, advising the administering authority as to how the operator intends to comply with the conditions of the environmental authority.

It may be noted that 2014 was an especially busy year for the Queensland legislators. The Strategic Cropping Land Act 2012 (Qld) was repealed by the Regional Planning Interests Act 2014 (Qld). The Strategic Cropping Land Act had identified and mapped certain land as being highly valuable for cropping and, except in exceptional circumstances, prohibited development activities likely to have a permanent impact on that land. Exceptional circumstances require that there be no alternative site for the development and that significant community benefits outweigh the likely adverse permanent impact on the land.

The Regional Planning Interests Act is much broader in areal reach, encompassing priority agricultural areas, priority living areas, the strategic cropping area and strategic environmental areas, each of which is an area of regional interest. Section 19 of the Act prohibits the wilful carrying out, or allowing the carrying out of, a resource activity¹²⁶ or a regulated activity¹²⁷ except by the authority of a regional interests development approval¹²⁸ (RIDA) issued under section 53 of the Act following an assessment of the extent of the expected impact of the activity on the area. The prohibition does not extend to resource activities in a priority agricultural area or in part of the strategic cropping area, where the authority holder for the resource activity and the landowner have entered into a conduct and compensation agreement under the relevant resource Act and the authority holder has complied with that agreement; where the landowner has entered into a written agreement consenting to the authority holder carrying out the activity; where the activity is not likely to have a significant impact on the priority agricultural area (ie, affect the suitability of the land to be used for a 'priority agricultural land use'¹²⁹) or the affected land in the strategic cropping area (ie, affect the land's

¹²⁴ See s 207 of the Environmental Protection Act.

¹²⁵ See s 286 of the Environmental Protection Act.

¹²⁶ Section 12(2) of the Regional Planning Interests Act.

¹²⁷ Section 17(1) of the Regional Planning Interests Act.

¹²⁸ Section 16(1) of the Regional Planning Interests Act.

¹²⁹ Section 8(2) of the Regional Planning Interests Act.

soil, climate and landscape features that make that area highly suitable, or likely to be highly suitable, for cropping),¹³⁰ and where the activity is not likely to have an impact on land owned by a person other than the landowner.¹³¹

A person who intends to carry out a resources activity or a regulated activity in an area of regional interest must make an assessment application¹³² accompanied by a report which assesses the impact on the area of regional interest of the proposed resource activity or regulated activity and identifies any constraints on the configuration or operation of the activity.¹³³ If the assessment application is notifiable¹³⁴ and unless the Chief Executive of the relevant department grants an exemption, the applicant must publish the assessment application and give the landowner notice of it.

Having received and published submissions from interested parties, the assessing agency may provide its recommendation regarding the application to the Chief Executive, which recommendation may include the imposition of conditions,¹³⁵ refusal of all or part of the application, advice about the application, or a statement that the assessing agency has no requirements or advice relating to the application.¹³⁶ The Chief Executive must take the advice of the Gasfields Commission¹³⁷ regarding the assessment application. The criteria to be adopted by the agency in assessing an application as required by section 41(2)(b) or by the Chief Executive in deciding an application as required by section 49(1)(b) are prescribed by section 14 of and Schedule 2 to the Regional Planning Interests Regulation 2014 (Qld).

The conditions of a RIDA for a priority agricultural area or part of the strategic cropping area prevail, to the extent of any inconsistency, over any conditions applicable under the relevant resource Act, in the case of a resource activity, or the relevant regulating Act, in the case of a regulated activity.

The Environmental Protection and Other Legislation Amendment Act 2014 (Qld) continues the work of the Greentape Act in simplifying the licensing regimes in Queensland. It amends the Environmental Protection Act to clarify the requirements for the management of contaminated land and to require mandatory certification by an auditor of the documents relating to the investigation of contaminated land,¹³⁸ it brings the penalties for serious offences into line with those in the Regional Planning Interests Act;¹³⁹ and it introduces enforceable undertakings which bind persons to 'make good' where identified non-compliance has occurred.¹⁴⁰

¹³⁰ *Ibid.*

¹³¹ Section 22 of the Regional Planning Interests Act.

¹³² Section 28 of the Regional Planning Interests Act.

¹³³ Section 29 of the Regional Planning Interests Act.

¹³⁴ Section 34 of the Regional Planning Interests Act.

¹³⁵ Section 50(1)(a)(ii) of the Regional Planning Interests Act allows for the imposition of a condition requiring the applicant to ensure that the impact of the activity is limited or restricted to a stated level.

¹³⁶ Section 42 of the Regional Planning Interests Act.

¹³⁷ The Gasfields Commission was established by the Gasfields Commission Act 2013 (Qld) with a broad range of functions, including to facilitate better relationships between landholders, regional communities and the onshore gas industry; to review the effectiveness of government entities in implementing regulatory frameworks that relate to the onshore gas industry; to advise ministers and government entities about the ability of landholders, regional communities and the onshore gas industry to coexist within an identified area, and to respond to requests for advice from the Chief Executive under the Regional Planning Interests Act.

¹³⁸ Chapter 7, Part 8 of the Environmental Protection Act is inserted by s 135 of the Environmental Protection and Other Legislation Amendment Act.

¹³⁹ Sections 65–101A (incl) of the Environmental Protection and Other Legislation Amendment Act.

¹⁴⁰ Chapter 10, Part 5 of the Environmental Protection Act is inserted by s 102 of the Environmental Protection and Other Legislation Amendment Act.

The Water Reform and Other Legislation Amendment Act 2014 (Qld) augments the comprehensive suite of reforms. The Act modifies section 185 of, and adds a new section 186 to, the Petroleum and Gas (Production and Safety) Act 2004 (Qld). Section 185 allows the holder of a petroleum tenure to ‘take or interfere with underground water in the area of the tenure if the taking or interference happens during the course of, or results from, the carrying out of another authorised activity for the tenure’. There is no limit on the volume of water that may be taken.¹⁴¹ The de-watering of CSG wells to allow the flow of CSG from coal seams would seem to be a permitted use under section 185.

Section 186 provides the additional limited right to ‘take or interfere with underground water in the area of the tenure for use in the carrying out of another authorised activity for the tenure’, subject to the volume of water taken being measured and reported to the Chief Executive. The use of underground water to pump down a well bore for the purposes of hydraulic fracturing operations would seem to be a permitted use under section 186. However, the right provided by section 186 is limited in time to two years from commencement of the section,¹⁴² following which the holder must be the holder of a water licence granted under Chapter 2, Part 3, Division 2 of the Water Act 2000 (Qld) or a water permit granted under Chapter 2, Part 3, Division 3 of the Water Act. Under section 1277 of the Water Act, the holder of a relevant petroleum tenure may, at any time prior to the two-year period, request the Chief Executive to grant one or more water licences or permits to take or interfere with underground water in the area of the tenure. After considering such matters as the historical take of underground water by the holder of the tenure and the take of underground water necessary for the holder to carry out its exploration or development programme, the Chief Executive must, to the extent the holder has demonstrated the need for the water licences or water permits and without the holder having complied with the formalities applicable to applications in Chapter 2, Part 3, grant one or more of the water licences or water permits for which applications have been made and may do so with or without conditions.

Queensland has also recently instigated a series of online initiatives such as *Queensland Globe* and *Coal Seam Gas Globe*,¹⁴³ which can be accessed to view CSG maps, mines maps, vegetation maps, tenures, registered water bores and water level monitoring bores, *CSG Net*, which engages landowners to monitor bores on their land on a monthly basis and report the data obtained¹⁴⁴ and *CSG Compliance Unit*,¹⁴⁵ which reports on investigations being conducted on any potential impacts of CSG operations on existing water bore supply and quality.

While most of the recent regulation relates to CSG, in July 2014 the Department of Natural Resources and Mines published a paper entitled ‘A Framework for the Next

¹⁴¹ Section 185(3) of the Petroleum and Gas (Production and Safety) Act.

¹⁴² Subordinate Legislation 2014 No 333 (Qld) provides that the date of commencement of s 186 is 18 February 2015.

¹⁴³ <http://dnrm.qld.gov.au/our-department/natural-resources-and-mines-data>. Given the concentration of CSG developments in the Surat Basin, it has been declared a cumulative management area and is the subject of an underground water impact report prepared by the Office of Groundwater Assessment to map predicted water level impacts, to provide water monitoring and management strategies and to assign monitoring functions to CSG operators in the Basin – www.dnrm.qld.gov.au/ogia/surat-underground-water-impact-report.

¹⁴⁴ The Department of Natural Resources and Mines monitors 300 bores to check groundwater levels and pressure heads – see www.ehp.qld.gov.au/management/non-mining/groundwater.html

¹⁴⁵ <http://dnrm.qld.gov.au/mining/coal-seam-gas/compliance/unit>.

Generation of Onshore Oil and Natural Gas in Queensland'.¹⁴⁶ The focus of the paper is the potentially large deep oil and gas deposits (being shale gas, shale oil, tight gas and basin-centred gas) in the Cooper, Southern Georgina, Isa Superbasin, Bowen and Maryborough Basins. These deposits are seen as having the potential to provide feedstock for Queensland's LNG projects beyond the expected life of the CSG industry. The paper recognises that legislative changes may be required to accommodate the higher costs and longer lead times required to develop deep oil and gas; in particular, tenure may need to be granted for longer terms, the dates for mandatory relinquishment of acreage extended and greater flexibility allowed in relation to the performance of obligatory work programmes. Where the basins extend into South Australia or the Northern Territory, consistency of petroleum, environmental, hydraulic fracturing, underground water management and other regulatory regimes across State and Territory borders will be necessary or desirable to facilitate developments, as will enhanced industry infrastructure. Amended codes of practice,¹⁴⁷ enhanced compliance requirements and extended community engagement are all seen as essential to the establishment of a deep oil and gas industry. However, the existing regulations applicable to conventional oil and gas, CSG, major projects and resource projects are considered to be sufficiently robust and comprehensive to apply to deep oil and gas.

NORTHERN TERRITORY

To date, no CSG resources susceptible of commercial development have been discovered in the Northern Territory, even though the exploration for and extraction of CSG by conventional means (which includes hydraulic fracturing) is permitted under the Petroleum Act 1984 (NT). Nevertheless, an Inquiry established by the Government on 14 April 2014 into hydraulic fracturing for hydrocarbon deposits and the potential effects on the environment attracted 263 submissions expressing concerns regarding issues such as water contamination; social, cultural and environmental impacts; water use; rivers and aquifers; health; short-term benefits; long-term impacts; a moratorium; monitoring and compliance; fugitive emissions; chemical usage and the regulatory regime.

The *Report of the Independent Inquiry into Hydraulic Fracturing in the Northern Territory* is dated 28 November 2014, but was only released to the public on 26 February 2015,¹⁴⁸ together with a set of draft guiding principles covering land access; well design, construction and operation; water management; air and noise emissions; community and social impacts; chemical and waste handling and management; rehabilitation and decommissioning, and local content. In formulating his recommendations, the Commissioner responsible for the Inquiry drew heavily on a publication of the Australian Council of Learned Academies¹⁴⁹ (ACOLA) following a three-year research programme.

¹⁴⁶ Department of Natural Resources and Mines, 'A Framework for the Next Generation of Onshore Oil and Natural Gas in Queensland' (2014) <https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0015/201183/framework-deep-gas-oil.pdf>.

¹⁴⁷ For example, it is proposed to review the Code of Practice for Constructing and Abandoning Coal Seam Gas Wells and Associated Bores and the Code of Practice for Well Head Emissions Detection and Reporting with a view to incorporating any changes applicable to wells targeting deep oil and gas.

¹⁴⁸ Hydraulic Fracturing Inquiry, 'Report of the Independent Inquiry into Hydraulic Fracturing in the Northern Territory' (28 November 2014) <<http://www.hydraulicfracturinginquiry.nt.gov.au/docs/report-inquiry-into-hydraulic-fracturing-nt.pdf>>.

¹⁴⁹ See n 7 – <http://acola.org.au/PDF/SAF06FINAL/Final%20Report%20Engineering%20Energy%20June%202013.pdf>.

The principal finding of the Report is that ‘the environmental risks associated with hydraulic fracturing can be managed effectively subject to the creation of a robust regulatory framework’, with the result that there is no justification for the imposition of a moratorium on hydraulic fracturing in the Northern Territory.¹⁵⁰ In light of this finding, the Report recommended the formation of a Cabinet Sub-Committee to oversee the work required for the Northern Territory to develop the standards for a best practice regulatory regime.

Other recommendations in the Report include restructuring of the Environmental Assessment Act; the adoption of best practice in well construction combined with rigorous integrity testing and effective regulatory oversight to make well failure a low probability; careful management of water uses; transparency in the use of chemicals, formalisation of a ban on the use of BTEX chemicals and best practice to minimise surface spills and manage, treat and dispose of flow-back water and produced water; accurate monitoring of, and accounting for, fugitive emissions; monitoring and reduction of noise impacts; best practice for decommissioning wells (although it was noted that the long-term integrity of decommissioned wells is poorly understood), and the inclusion of robust monitoring regimes in the management and regulation of a developing unconventional gas industry in the Northern Territory.

TASMANIA

To date, there has been no hydrocarbon production in Tasmania, nor has any hydraulic fracturing been undertaken there. However, in March 2014 the Government introduced a moratorium for a period of 12 months on the use of hydraulic fracturing in Tasmania, pending the outcome of a review of the potential use of hydraulic fracturing; the applicable environmental and safety standards; potential impacts of hydraulic fracturing on agriculture, groundwater and the environment; national and international developments in the regulation of hydraulic fracturing; the adequacy of existing Tasmanian laws, and costs, benefits and other relevant matter.

The review was conducted by officers of the Department of Primary Industries, Water and the Environment, the Environment Protection Authority and Mineral Resources Tasmania, a Division of the Department of State Growth, and the Final Report was presented on 25 February 2015. The findings of the review were generally more negative than those of similar reviews in the other States and Territories and, presumably, reflected the lack of experience of petroleum exploration in that State. The findings included:

there appears to be substantial community concern that fracking is inherently unsafe and unmanageable; ... Appraisal and production of unconventional hydrocarbon resources have implications for agricultural areas including water resources and potential for contamination of land, water and air; ... The process of unconventional hydrocarbon resource appraisal and production may pose a potential risk to groundwater and surface water quality; ... Fracking poses a potential risk to the broader Tasmanian environment, including surface water quality and localised impacts on air quality, visual amenity and natural ecosystems; ... Any future hydrocarbon production would lead to the release of carbon dioxide as processed fuels are burnt to produce energy, ... The public submissions to the review outlined significant concern that the establishment of an unconventional hydrocarbon production industry in Tasmania would be

¹⁵⁰ See Executive Summary, at x.

detrimental to Tasmania's clean and green image and associated food, beverage and tourism industries.¹⁵¹

Unsurprisingly, on 26 February 2015 the Tasmanian Government announced a five-year moratorium on hydraulic fracturing in the State during which period the Government proposes to 'continue to consult all stakeholders and monitor national and international developments in policy, scientific understanding of fracking practices, environmental and public health issues and energy and market developments'.¹⁵² Effective 26 March 2015, the Government's decisions in response to the review were formalised in the Tasmanian Government Policy Statement on Hydraulic Fracturing (Fracking) 2015.¹⁵³ The Policy Statement notes that it is highly unlikely that Tasmania has economically viable CSG resources; that little is known about the potential for unconventional oil and gas there, and that the use of hydraulic fracturing in Tasmania is perceived to be a *possibility*, not a *probability*.

Going forward – the challenge

Petroleum mining code

The Commonwealth, State and Territory offshore petroleum legislation¹⁵⁴ and the onshore petroleum legislation in Western Australia, Victoria and the Northern Territory all incorporate the same petroleum mining code, which was agreed in 1967 to ensure the uniformity of regulation of offshore oil and gas exploration and production. For convenience, reference will be made to the Western Australian onshore legislation, the Petroleum and Geothermal Energy Resources Act 1967 (WA Act), in describing the features of the petroleum mining code.

The WA Act provides for the grant of petroleum tenements in respect of graticular blocks measured from the meridian of Greenwich and each constituted by a distance from that meridian of five minutes, or a multiple of five minutes, of longitude and by a distance from the equator of five minutes, or a multiple of five minutes, of latitude.¹⁵⁵ The principal petroleum tenements are exploration permits, retention leases, production licences and access authorities. The maximum size of an exploration permit is 400 graticular blocks¹⁵⁶ and permittees are required to relinquish one-half of the blocks at the expiration of the initial term of six years and the expiration of each renewed term of five years.¹⁵⁷

Section 29 of the WA Act prohibits exploration for petroleum in Western Australia except under and in accordance with an exploration permit and section 38 authorises the permittee to explore for petroleum, and to carry on such operations and execute such works as are necessary for that purpose, in the permit area. Similarly, section 39 of the WA Act prohibits operations for the recovery of petroleum in Western Australia

151 *Review of Hydraulic Fracturing in Tasmania* (Final Report, 25 February 2015) 4 and 5.

152 Media Release dated 25 February 2015, The Hon Jeremy Rockliff MP, Minister for Primary Industry and Water, and The Hon Paul Harris MP, Minister for Resources.

153 Tasmanian Government, 'Tasmanian Government Policy Statement on Hydraulic Fracturing (Fracking) 2015' (26 February 2015) <http://dipwwe.tas.gov.au/Documents/Tasmanian%20Fracking%20Policy%20Statement_26-2-15.pdf>

154 See n 17.

155 Section 27 of the WA Act.

156 Section 31(1) of the WA Act.

157 Section 41 of the WA Act.

except under and in accordance with a production licence and section 62 authorises the licensee to recover petroleum in the licence area and to recover petroleum from the licence area in another area to which he has lawful access for that purpose. Any exploration for or recovery of petroleum other than pursuant to the statutory scheme is unlawful.¹⁵⁸ In consequence, the rights of the licensee to recover petroleum are to be determined by reference to the provisions of the Act, rather than by reference to common law doctrines such as the Rule of Capture (if it were to be applicable in Australia).

Where petroleum is discovered in the permit area, the permittee must inform the Minister forthwith of the discovery¹⁵⁹ and may nominate the contiguous graticular blocks in which a petroleum pool has been identified for declaration as a location.¹⁶⁰ Only the blocks in which the petroleum pool is situated may be included in a location and only the blocks which constitute a location may be the subject of an application for a production licence.¹⁶¹ A petroleum pool is defined in section 5(1) to mean ‘a naturally occurring discrete accumulation of petroleum’. Blocks may not be nominated as a location unless petroleum has been recovered from the petroleum pool.¹⁶² Where the petroleum pool is within the area of an exploration permit or a retention lease, the Minister may give directions to the lessee ‘to determine the chemical composition and physical properties of that petroleum and to determine the quantity of petroleum in the petroleum pool to which the discovery relates or, if only part of that petroleum pool is within the lease area, in such part of the petroleum pool as is within the lease area’.¹⁶³

Where a petroleum pool is partly in a particular licence area and partly in another area in respect of which another person has authority to carry out operations for the recovery of petroleum from the pool, section 69 of the WA Act allows a licensee in whose licence area there is a part of a particular pool to apply to the Minister, ‘for the purpose of securing the more effective recovery of petroleum from the petroleum pool’, for a direction that any licensee whose licence area includes part of the petroleum pool to enter into an agreement, within the period specified by the Minister, for or in relation to the unit development of the petroleum pool.

Section 7A(2) and (3) further provide:

- (2) Where a well-head is situated in a licence area or in an area in respect of which an access authority is in force (in this subsection called an **access authority area**) and the well from that well-head is inclined so as to enter a petroleum pool ... , being a pool ... that does not extend to that licence area or access authority area, at a place within an adjoining licence area of the same licensee or registered holder of the access authority, any petroleum ... recovered through that well shall be deemed to have been recovered in that adjoining licence area under the licence in respect of that area.
- (3) Where a petroleum pool ... is partly in one licence area and partly in an adjoining licence area of the same licensee and petroleum ... is recovered from that pool ... through a well or wells in one or both of the licence areas, there shall be deemed to be recovered in each of the licence areas, under the licence in respect of that area, such proportion of all petroleum ... so recovered as may reasonably be treated as

¹⁵⁸ *Commonwealth of Australia v WMC Resources Limited* (1999) 194 CLR 1 at 123 and 171.

¹⁵⁹ Section 44 of the WA Act.

¹⁶⁰ Sections 46 and 47 of the WA Act. See *Chandler* (n 78) at 46.

¹⁶¹ Section 50 of the WA Act.

¹⁶² Section 46(5) of the WA Act.

¹⁶³ Section 48K(1) of the WA Act.

being derived from that area, having regard to the nature and probable extent of the pool..., and the respective proportions shall be determined (by agreement between the licensee and the Minister or may be determined by the Supreme Court on the application of the licensee or the Minister).

It is clear from the definition of petroleum pool and the sections referred to above that the references to a petroleum pool are to an underground accumulation of petroleum in a discrete natural reservoir bounded by geological barriers so that it is effectively separated from other accumulations, where the accumulation is the subject of a single natural pressure system so that production of petroleum from one part of it affects the reservoir pressure throughout its extent. In other words, a petroleum pool as defined is referring to a conventional trap where the accumulation is contained by a geological formation or stratigraphic trap.

Tight gas formations in which there are gas accumulations with large spatial dimensions and indistinctly defined boundaries are referred to as basin-centred gas accumulations. In the case of unconventional gas, basin-centred gas accumulations are defined by abnormal pressure, in situ gas permeability equal to or less than 0.1 md, continuous gas saturation and no down-dip water leg. If any of these elements is missing, the gas will be regarded as having accumulated in a conventional gas reservoir.¹⁶⁴ In the case of convention oil and gas, the boundaries of the petroleum pool or trap are clearly defined; in the case of unconventional oil and gas they are not.

It is this statutory framework which makes the petroleum mining code fundamentally inappropriate for the regulation of continuous-type deposits such as shale oil and shale gas, where the petroleum accumulations 'are pervasive throughout a large area and (that) are not affected by hydrodynamic influences'.¹⁶⁵

Other states

The onshore legislation enacted in South Australia, New South Wales, Queensland and Tasmania does have the same focus on petroleum pools, but the legislative intent and suitability are not necessarily clear.

Section 35(1)(a) of the Petroleum and Geothermal Energy Act 2000 (SA) allows the holder of an exploration licence or a retention licence to apply for a production licence if petroleum 'exists in the area for which the production licence is to be granted', implying that the petroleum could be in coal seams or oil-bearing shales rather than a petroleum pool. However, Section 42 provides that the Minister may direct that a natural reservoir containing petroleum which extends beyond the area of a production licence into an adjacent licence area be developed as a single unit. Does a natural reservoir always refer to a discrete accumulation of petroleum or is it just a reference to a stratum of the earth in which petroleum is present?

Section 28(1)(b) of the Petroleum (Onshore) Act 1991 (NSW) allows the Director-General to direct the holder of a petroleum title in which petroleum has been discovered to provide particulars of 'the nature of the stratum in which the petroleum occurs' and, under section 28(2), to direct the holder 'to determine the quantity of petroleum in the petroleum deposit to which the discovery relates or, if part only of that petroleum deposit is within the land comprised in the title, in the part of the petroleum deposit

¹⁶⁴ See n 7, 135.

¹⁶⁵ See n 7.

that is within the title'. Section 3(1) defines petroleum deposit as 'any naturally occurring accumulation of petroleum on or below the surface of the earth' (but without any reference to a discrete accumulation) and section 28A confers on the holder of a petroleum title, in addition to the other rights conferred by the Act, the right to explore the land comprised in the title 'for the existence and availability of natural reservoirs'. The relationship (if any) between petroleum deposits and natural reservoirs is unclear.

The holder of a production lease 'has the exclusive right to conduct petroleum mining operations in and on the land included in the lease',¹⁶⁶ but there are no provisions in the Act or the Regulations promulgated under it relating to unitisation where the petroleum deposit extends beyond the boundaries of the production lease into the land the subject of another petroleum title.

Section 800 of the Petroleum and Gas (Production and Safety) Act 2004 (Qld) (the 2004 Act) prohibits the exploration for or production of petroleum in relation to land unless either the activity is carried out under the authority of a petroleum tenure granted under the Act or under the Petroleum Act 1923 (Qld) (the 1923 Act) or, in the case of exploration for or mining of CSG, the activity is carried out under a coal or oil shale mining tenement granted under the Mineral Resources Act 1989 (Qld). Section 109(1) of the 2004 Act allows the holder of a petroleum lease to carry activities which include exploring for petroleum and petroleum production, but petroleum is *produced* when it has been recovered or released to ground level from the natural underground reservoir in which it has been contained or from which it has been extracted.¹⁶⁷ A natural underground reservoir is defined to be part of a geological formation or structure in which petroleum has accumulated or which is suitable for the storage of petroleum¹⁶⁸ and a petroleum discovery is defined to include 'a discovery of a natural underground reservoir that has, or is likely to have', commercial storage potential under the Act.¹⁶⁹

Unless CSG is produced as incidental coal seam gas under section 318CM of the Mineral Resources Act, it must be produced under a petroleum lease. Given that CSG is defined to be 'petroleum (in any state) occurring naturally in association with coal or oil shale, or in strata associated with coal or oil shale mining'¹⁷⁰ the obvious question is whether it has accumulated in a natural underground reservoir. It seems unlikely that CSG which occurs naturally in strata associated with coal or oil shale mining, or shale oil or shale gas produced from oil-bearing shales, could be said to be produced from natural underground reservoirs that have, or are likely to have, commercial storage potential. However, there are some cases where tight gas formations can be suitable for use as a gas storage facility.¹⁷¹

Chapter 2, Part 2, Division 1, Subdivision 2 of the 2004 Act¹⁷² makes provision for coextensive natural underground reservoirs. If a natural underground reservoir in the area of a petroleum lease extends to the area of an adjacent petroleum lease or coal or oil shale mining lease, or extends to the area the subject of an application for such a lease, the holder of the petroleum lease and the holder of (or applicant for) the adjacent lease may enter into a coordination agreement relating to the production of petroleum

¹⁶⁶ Section 41 of the Petroleum (Onshore) Act 1991 (NSW).

¹⁶⁷ Section 15(1) of the 2004 Act.

¹⁶⁸ Section 13 of the 2004 Act.

¹⁶⁹ Schedule 2 to the 2004 Act.

¹⁷⁰ Section 299(1) of the 2004 Act.

¹⁷¹ See n 7 at 137.

¹⁷² See also s 52A of the 1923 Act.

from each area. The lease holder may not carry out petroleum production activities unless the adjacent lease holder (or applicant) has consented to the carrying out of the activities or has entered into a coordination agreement, or unless the Land Court has decided the amount or proportion of the petroleum to which each of them is entitled, how they are to bear the costs of production and how the production is to be coordinated or monitored.¹⁷³ Can this regime be applied to determine disputes as entitlements to CSG?

Under section 3 of the Mineral Resources Development Act 1995 (Tas), petroleum products except oil shale are Category 4 minerals and coal, peat, lignite, oil shale and CSG are Category 2 minerals. Production activities in relation to a Category 4 mineral include 'the carrying out of an activity to release, or recover, petroleum from a petroleum reservoir in which it is contained'.¹⁷⁴ A petroleum reservoir is defined to be part of a geological structure in which gas or petroleum has accumulated and that is suitable for the storage and transmission of gas or petroleum.¹⁷⁵

Section 67U of the Mineral Resources Development Act prohibits a person from carrying out production activities for Category 4 minerals unless he is the holder of a petroleum production licence in relation to the minerals or he is authorised by the holder of such a production licence to do so, and section 67N authorises the holder of a petroleum production licence to carry out, in accordance with the conditions of the licence, in the area of land specified in the licence, such production activities.

The Minister has a discretion as to the size of the area of land to comprise a petroleum production licence.¹⁷⁶ It must be, in the Minister's opinion, sufficient to enable future petroleum production in relation to the petroleum field to which the field development plan relates and to enable future storage in any petroleum reservoir to which the licence relates. The field development plan must set out information in relation to the petroleum resources contained in a petroleum reservoir to which the licence relates or is to relate. Again, the legislative structure is one relevant to conventional oil and gas, rather than unconventional oil and gas. But there is no provision restricting the production activities to petroleum in the area of the petroleum production licence as at the date of its grant, nor are there unitisation provisions regulating the rights and obligations between licence-holders where the petroleum reservoir extends beyond the boundaries of one licence area into another.

Category 2 minerals such as CSG are to be mined under a mining lease and section 69 of the Mineral Resources Development Act prohibits a person from carrying out any mining in any area of land unless the person is the holder of a mining lease in respect of that area of land. The area of land comprised in a mining lease is the area determined by the Minister as being at least the minimum area required for mining operations.¹⁷⁷ In relation to CSG, this would seem to require some predetermination by the Minister of the areal extent of the coal seams from which the applicant for a mining lease intends to produce the CSG. Given that oil shale is defined to be shale which yields liquid or gaseous hydrocarbons on distillation, it would also seem to produce the anomaly that shale oil and shale gas are produced under a petroleum production licence, whereas CSG is mined as a Category 2 mineral under a mining lease.

¹⁷³ Sections 113–116 of the 2004 Act.

¹⁷⁴ Section 3B(1) of the Mineral Resources Development Act.

¹⁷⁵ Section 3 of the Mineral Resources Development Act.

¹⁷⁶ Section 67M of the Mineral Resources Development Act.

¹⁷⁷ Section 83(1) of the Mineral Resources Development Act.

Maybe it is just as well Tasmania is viewed as having low potential for CSG production.

Rule of Capture

The Rule of Capture applies to the onshore areas of the US to allow the lessee of an area of land the subject of an oil and gas lease, or the landowner in whom is vested the oil and gas rights in respect of that area, lawfully to produce not only oil and gas naturally occurring in that land, but also oil and gas which migrates into that area during production operations from land owned by third parties.¹⁷⁸ As such, the Rule of Capture facilitates the production of CSG, shale oil and shale gas where the areal extent of the coal seams from which the CSG is being produced and of the hydraulic fractures which allows the shale oil and shale gas to be produced extend beyond the leased area and where there is no petroleum pool or natural underground reservoir in which the oil and gas has accumulated and which could be the subject of voluntary or compulsory unitisation.

As noted above, section 62(1)(a) of the WA Act gives a licensee the right 'to recover petroleum in the licence area and to recover petroleum from the licence area in another area to which he has lawful access for that purpose'. In debates regarding whether the Rule of Capture applies in Australia by implication from the relevant statutory provisions, the question is often raised as to whether the reference to 'petroleum in the licence area' is a reference to petroleum within the licence area *at the date of grant* of the production licence or petroleum which is within the licence *at any particular point in time*, having migrated there from adjoining lands.¹⁷⁹ Decisions relating to the Rule of Capture in other jurisdictions have confirmed that, because the owner of adjoining land has no proprietary right to unstable or fugacious substances or matter within the land, he has no cause of action if the substances or matter flow to other land from which they are removed by a third party.¹⁸⁰

The preferred view is that section 62(1) refers to petroleum in the licence area at the time of grant of the production licence, because that conclusion is supported by considerations of reservoir management and equity which prevail over considerations of convenience supportive of the contrary view.¹⁸¹ Where the Rule of Capture does apply, the competition between landowners or lessees or licensees of adjacent lease or licence areas for migratory oil and gas tends to result in excessive capital expenditure

¹⁷⁸ See generally, Daintith (n 26).

¹⁷⁹ Earlier statutory versions of the grant of production rights were more compelling in evincing an intention to rebut the application of the Rule of Capture. For example, s 31(2) of the Petroleum Act 1923 (Qld) provided that a petroleum lease conferred upon the lessee 'the exclusive right to drill for, mine, extract, recover and dispose of all petroleum in or under the land demised'. Clearly, the reference was to petroleum which was in or under the land at the time when it was demised.

¹⁸⁰ *M Borys v Canadian Pacific Railway* [1953] AC 217, 228–30; *Imperial Oil Limited v Placid Oil Company* (1953) 43 WWR 437. Cf *Gartner v Kidman* (1961) 108 CLR 12 in relation to the flow of underground water in Australia.

¹⁸¹ M Crommelin, 'The US Rule of Capture: Its Place in Australia' [1986] AMPLA Yearbook 265, 279–80. However, it has been forcefully argued that the unitisation provisions which appear in the petroleum mining code (see s 69 of the WA Act) have the effect of instituting a statutory Rule of Capture. They give the relevant minister a discretion to direct the holders of production licences in respect of a petroleum pool, partly in the area of one of the production licences and partly in the area of the other, to enter into an agreement for the unit development of the petroleum pool 'for the purpose of securing the more effective recovery of petroleum from the petroleum pool'. If the minister does not give such a direction, presumably having concluded that it is unnecessary for the more effective recovery of petroleum, it is suggested a licensee may proceed lawfully to recover petroleum from the pool regardless of the licence area in which it is recovered: see Daintith (n 26) at 360.

on wells, production of petroleum at rates in excess of the maximum efficient rate and a reduction in the overall recovery factor.¹⁸²

Section 106 of the WA Act provides for the grant of an access authority which allows a permittee or licensee to carry on outside the limits of the permit area or licence area petroleum exploration operations or operations related to the recovery of petroleum in or from the permit area or licence area. Note that an access authority does not authorise the recovery of petroleum from a permit area or a licence area; rather, it authorises operations *related to* the recovery of petroleum. Further, the holder of an access authority is prohibited from drilling a well, other than a well deviated into the adjacent permit area or licence area.¹⁸³

Section 11A(1) of the WA Act confirms the common law principle that property in petroleum passes to the permittee or licensee upon severance of the petroleum from the land, by providing that:

Subject to this Act and to any rights of other persons, on the recovery of any petroleum by a ... permittee ... or licensee ... in the permit area or licence area, the petroleum becomes the property of the ... permittee ... or ... licensee.

When the equivalent section of the petroleum mining code in the offshore legislation was amended,¹⁸⁴ the qualification that the vesting of property in petroleum recovered is subject to *any rights of other persons* was removed.¹⁸⁵ The removal was for the expediency of preventing claims by the holders of native title under the Native Title Act 1993 (Cth) making claim to petroleum recovered from land in respect of which they hold native title. It was suggested that the amendment had, probably unintentionally, introduced the Rule of Capture into Australia's offshore petroleum laws.¹⁸⁶

Because section 285(4) of the Offshore Petroleum and Greenhouse Gas Storage Act, like section 11A(1) of the WA Act, expressly provides that the vesting of property in petroleum on recovery takes effect *subject to this Act*, the general view is that it only applies to petroleum which has been *lawfully* recovered from the permit area or the licence area. As the petroleum which can be lawfully recovered is only petroleum located in the permit area at the date of grant of the permit, or located in the licence area at the date of grant of the production licence, section 285 cannot apply to legitimise the recovery of petroleum from within the permit or licence area which either is located outside the permit or licence area at the time of recovery or which migrates into the permit or licence area as the result of production operations.

It follows from the conclusion that the Rule of Capture is precluded from application by the provisions of the petroleum mining code (and possibly other State

¹⁸² L Trachtenberg, 'Reconsidering the use of Forced Pooling for Shale Gas Development' (2011–12) 19 Buff Envtl LJ 179, 181.

¹⁸³ Section 106(6) of the WA Act.

¹⁸⁴ Section 285 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) and, prior to that Act, s 127 of the Petroleum (Submerged Lands) Act 1967 (Cth).

¹⁸⁵ Offshore Petroleum and Greenhouse Gas Storage Act 2006, s 285(3). In the case of those States which have not adopted the petroleum mining code, a case may be made that the Rule of Capture could apply. For example, s 7(1) of the Petroleum (Onshore) Act 1991 (NSW) prohibits a person from mining for petroleum *except in accordance with a petroleum title* and in both this section and s 41 there is no reference to the petroleum in relation to which mining operations are proscribed or permitted being within the area of the land included in the relevant petroleum lease.

¹⁸⁶ JP Keen, 'Commonwealth Draft Guidelines for Trans-boundary Unitisations and the Rule of Capture' [1998] AMPLA Yearbook 433, 440–43.

legislation), that it is unlawful for a licensee to recover from within the licence area petroleum located outside the licence area.¹⁸⁷ This is a further impediment to the application of the petroleum mining code to unconventional oil and gas, given that the extent of the coal seams and oil-bearing shales, especially following hydraulic fracturing, may make it difficult to determine the areal extent of the source of the CSG, shale oil or shale gas.

Securities regulation

The Listing Rules of the Australian Stock Exchange (ASX)¹⁸⁸ require oil and gas producing and exploration entities to report quarterly on their activities, including estimates of petroleum reserves, contingent resources and prospective resources,¹⁸⁹ classified in accordance with the SPE-PRMS Guidelines. Reports must not disclose 'total petroleum initially-in-place, total resource base, remaining recoverable resources or hydrocarbon endowment' unless, proximate to that disclosure, there are included the above estimates and a disclosure as to 'whether and how each of the resource classes in the summation were adjusted for risk'.¹⁹⁰

Chapter 8, 'Unconventional Resources Estimation', of the SPE-PRMS Guidelines highlights the difficulties in applying the methodologies used for conventional oil and gas reserves and resources assessment to unconventional oil and gas. For example, in the case of tight gas, the volume of gas initially in place in basin-centred gas accumulations is generally much larger compared with conventional reservoirs, but the gas recovery efficiency, as a percentage of the total gas initially in place in the entire basin without a water leg, is generally much lower than a conventional reservoir.¹⁹¹

In the case of CSG, because coal properties can vary substantially over short distances and sufficient data needs to be collected to develop recovery estimates in areas beyond the limits of known data, in the initial period of appraisal or development, substantial 2P reserves growth is often reported until the full resource potential is understood and disclosed. As the SPE-PRMS Guidelines note:

In the absence of any further modifying information, using typical well spacing conventions, each Proved Development well can 'prove up' a further 8 Proved Undeveloped and 40 Probable locations. The full area can be categorized as 2P reserves if 1/49 (approximately 2 per cent) of the total planned wells were to be successfully drilled and placed on production at commercial rates. This is premised on establishing that this well group is located in the coal fairway in terms of laterally continuous coal thickness and sufficient gas content and permeability.¹⁹²

While the approach of booking CSG reserves based on the traditional incremental well spacing approach is said to have the advantages of a predictable rules-based system, the best estimate of well outcomes in all reserves categories relies primarily on area; the ultimate limits of the project need to be defined for reserves to be claimed

¹⁸⁷ It would be a defence to a prosecution for a contravention of s 49(1) of the WA Act that the licensee was operating under an honest and reasonable mistake of fact that the petroleum recovered was located in the licence area – *Proudman v Dayman* (1941) 67 CLR 536.

¹⁸⁸ By virtue of s 793C of the Corporations Act 2001 (Cth), the ASX Listing Rules have the force of law.

¹⁸⁹ ASX Listing Rules 5.2, 5.4 and 5.25.

¹⁹⁰ ASX Listing Rule 5.25.3.

¹⁹¹ SPE-PRMS Guidelines (n 11) 138, 139.

¹⁹² SPE-PRMS Guidelines (n 11) at 150.

in respect of that area, given the project-based principles embodied in the SPE-PRMS Guidelines, and this approach may not clearly distinguish between the risk of the likelihood of commercial production being realised from a given project and the uncertainty as regards the volume of production that will actually be recovered from that project.¹⁹³

Importantly in an Australian context, no State or Territory has adopted 'typical well spacing conventions' although, as a matter of industry practice, CSG wells are usually spaced between 600 metres and 1,200 metres apart.

In the case of shale gas, Proved Reserves and Developed Producing Reserves are typically categorised using a decline-curve analysis. Horizontal wells typically have a steep initial decline which levels out after a period of production. Unless the shape of the decline curve is reflective of the decline curve of other shale gas wells in the same gas accumulation or of wells in analogous gas accumulations, it is necessary to assess the likely Reserves early in the productive life of the well. This tends to result in adoption of a conservative decline to assign Proved Reserves and a less conservative decline to assign Developed Probable and Possible Reserves. In the case of Proved Undeveloped Reserves and Undeveloped Probable and Possible Reserves, uncertainties such as lateral continuity of shales, variability in performance of individual wells, overall area of the project, permeability-thickness, lateral length of fractures and effectiveness of completions all add to the difficulty in the choice of appropriate decline curves for offset and more remote wells. Again, the result is likely to be very conservative reserves estimates and very optimistic estimates of 3P reserves.¹⁹⁴

Pooling

In the onshore areas of the US, title to substantially all of the oil and gas in situ is vested in private landowners. A landowner may lease the rights to explore for and produce the oil and gas to a lessee, for consideration which is typically a royalty. The lease may include a clause allowing the lessee to combine or 'pool' the land the subject of the lease with other freehold or leasehold land in the vicinity, so that the aggregate area of the land is of sufficient areal extent to support the drilling of one well or a proposed multi-well programme. Production is shared in the proportions which bear to the whole the same proportions as the area of land contributed by each lessee or landowner bears to the aggregate area of the pooled land, although more sophisticated production sharing arrangements may be agreed.

Pooling is usually by voluntary agreements but States such as New York, Pennsylvania, Ohio and Texas have legislated for forced pooling (or compulsory integration) of so-called 'spacing units'¹⁹⁵ to require landowners to join with well operators in developing their oil and gas resources or to allow a landowner whose oil and gas resources have not been included in a development plan by a well operator to add his land to a pooled area.¹⁹⁶

¹⁹³ *Ibid.*, 151.

¹⁹⁴ *Ibid.*, 159.

¹⁹⁵ A spacing unit is the maximum area from which oil and/or gas can be efficiently and economically recovered using a single well.

¹⁹⁶ See BM Kramer, 'Oil and Gas Leases and Pooling: A Look Back and a Peek Ahead' (2012–13) 45 *Tech L Rev* 877; and see Trachtenberg (n 181).

A factor in the increased use of pooling has been the use of horizontal drilling in shale oil and shale gas production. Unauthorised drilling into or through the subsurface of a neighbour's land has been held to be trespass¹⁹⁷ and pooling avoids this consequence. The advantage of pooling is that, unlike the provisions of the petroleum mining code and unitisation, it does not require the petroleum to have accumulated in a discrete petroleum pool or reservoir. So the pooled area could be the mapped areal extent of coal seams from which CSG is being produced or the area of oil-bearing shales from which wells are producing shale oil or shale gas. With adaption, it could answer some of the concerns raised above.

Conclusions

As the review of existing legislation indicates, there is a need to clarify when unconventional resources are to be produced as petroleum under petroleum legislation or mined or extracted as minerals under mining legislation.

The policy deliberations to date have focused on the use of hydraulic fracturing in CSG operations, where there is little evidence of use, rather than on the disposal of significant volumes of saline water and quantities of salt generated in the process of de-watering large numbers of CSG, particularly in Queensland.

There has been little legislative or policy attention to shale oil and shale gas, other than in the context of hydraulic fracturing and the use of BTEX chemicals. This may not be such a bad thing, given that the findings of a recent assessment¹⁹⁸ in the US which concluded, among other things, that:

- there is not evidence of widespread, systemic impacts on drinking water resources in the US resulting from (1) water withdrawals in times or places of low water availability, (2) spills of hydraulic fracturing fluids and produced water, (3) fracturing directly into underground drinking water resources, (4) below-ground migration of liquids and gases, or (5) inadequate treatment and discharge of wastewater; and
- the instances of contamination of drinking water resources resulting from hydraulic fracturing was small when compared with the number of hydraulically fractured wells.

The existing petroleum legislation is highly biased towards conventional oil and gas and the emphasis on *petroleum pools* presents particular problems in the case of unconventional oil and gas, where the hydrocarbons are not in a discrete natural reservoir and within the interpreted closure of a geological structure or stratigraphic trap.

¹⁹⁷ *Hastings Oil Co v Tex Co*, 234 SW2d 389, 398 (Tex 1950). However, in *Coastal Oil & Gas Corp v Garza Energy Trust*, 268 SW3d 1 (Tex 2008), the Supreme Court of Texas declined to decide whether trans-boundary hydraulic fracturing amounted to trespass.

¹⁹⁸ An executive summary of the Assessment has been released in draft only, and is not to be cited or quoted.

Schedule: definitions of petroleum and minerals

Jurisdiction	Offshore		Onshore	
	Petroleum	Mining	Petroleum	Mining
COMMONWEALTH	<p>Section 7 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) (the Commonwealth Act) defines petroleum as follows:</p> <p>Petroleum means -</p> <p>any naturally occurring hydrocarbon, whether in a gaseous, liquid or solid state; or any naturally occurring mixture of hydrocarbons, whether in a gaseous, liquid or solid state; or any naturally occurring mixture of: one or more hydrocarbons, whether in gaseous, liquid or solid state; and</p> <p>one or more of the following, that is to say, hydrogen sulphide, nitrogen, helium and carbon dioxide;</p> <p>and:</p> <p>includes any petroleum as defined in paragraph (a), (b) or (c) that has been returned to a natural reservoir;^a</p>	<p>Section 22 of the Offshore Minerals Act 1994 (Cth) defines mineral as follows:</p> <p>(1) <i>A mineral is a naturally occurring substance or a naturally occurring mixture of substances.</i></p> <p>(2) <i>Without limiting subsection (1), a mineral may be in the form of sand, clay, limestone, rock, evaporates, shale, oil shale or coal.</i></p> <p>Section 4 of the Offshore Minerals Act adopts in substance the same definition of petroleum as is set out in the Commonwealth Act.</p>	<p>The Commonwealth does not have jurisdiction to make laws with respect to exploration for or production of petroleum within the boundaries of a State or Territory.</p>	<p>The Commonwealth does not have jurisdiction to make laws with respect to exploration for or mining of minerals within a State or Territory.</p>
WESTERN AUSTRALIA	<p>Section 4 of the Petroleum (Submerged Lands) Act 1982 (WA) adopts in substance the same definition of petroleum as is set out in the Commonwealth Act.</p>	<p>Section 22 of the Offshore Minerals Act 2003 (WA) (the WA Act) defines mineral as follows:</p> <p>(1) <i>A mineral is a naturally occurring substance or a naturally occurring mixture of substances.</i></p>	<p>Section 5(1) of the Petroleum and Geothermal Energy Resources Act 1967 (WA) defines petroleum as follows:</p> <p>Petroleum means -</p> <p>(a) any naturally occurring hydrocarbon (whether in a gaseous, liquid or solid state); or</p>	<p>Section 8(1) of the Mining Act 1978 (WA) defines minerals as follows:</p> <p>Minerals means naturally occurring substances obtained or obtainable from any land defines minerals as follows: carried out on or under the surface of the land, but does not include –</p>

(Continued)

Continued.

Jurisdiction	Offshore		Onshore	
	Petroleum	Mining	Petroleum	Mining
SOUTH AUSTRALIA	Section 4(1) of the Petroleum (Submerged Lands) Act 1982 (SA) adopts in substance the same definition of petroleum as is set out in the Commonwealth Act.	Section 22 of the Offshore Minerals Act 2000 (SA) adopts the same definition of mineral as is set out in the WA Act.	Section 4(1) of the Petroleum and Geothermal Energy Act 2000 (SA) defines petroleum as follows: Petroleum means a naturally occurring substance consisting of a hydrocarbon or mixture of hydrocarbons in gaseous, liquid or solid state but does not include coal	Section 6(1) of the Mining Act 1971 (SA) defines minerals as follows: Minerals means - (a) any naturally occurring deposit of metal or metalliferous ore, precious stones or any other mineral (including sand, gravel, stone, shell, coal, oil shale, shale and clay); or
		(2) Without limiting subsection (1), a mineral may be in the form of sand, gravel, clay, limestone, rock, evaporates, shale, oil-shale or coal. Section 5 of the Offshore Minerals Act defines petroleum as follows: 'petroleum' means - (a) a hydrocarbon or a mixture of hydrocarbons; or (b) a mixture of one or more hydrocarbons and one or more of the following - (i) hydrogen sulphide; (ii) nitrogen; (iii) helium; (iv) carbon dioxide.	(b) any naturally occurring mixture of hydrocarbons (whether in a gaseous, liquid or solid state); or (c) any naturally occurring mixture of one or more hydrocarbons (whether in a gaseous, solid or liquid state), and one or more of the following: hydrogen sulphide, nitrogen, helium or carbon dioxide, and includes any petroleum as defined by paragraph (a), (b) or (c) that has been returned to a natural reservoir; but excludes oil shale; Section 5(1) of the Petroleum and Geothermal Energy Resources Act defines oil shale to include naturally occurring hydrocarbons that are or may be contained in rocks from which they cannot be recovered otherwise than by mining those rocks as oil shale.	(a) soil; or (b) a substance the recovery of which is governed by the Petroleum and Geothermal Energy Resources Act 1967 or the Petroleum (Submerged Lands) Act 1982; or (c) without limiting paragraph (b), geothermal energy resources as defined in the Petroleum and Geothermal Energy Resources Act 1967 section 5(1); or (d) a meteorite as defined by the Museum Act 1969; or (e) any of the following substances if it occurs on private land - (i) limestone, rock or gravel; or (ii) shale, other than oil shale; or (iii) sand, other than mineral sand, silica sand or garnet sand; or (iv) clay, other than kaolin, bentonite, attapulgite or montmorillonite; Section 8(1) of the Mining Act adopts the same definition of oil shale as is set out in the Petroleum and Geothermal Energy Act.

VICTORIA

Section 6(1) of the Offshore Petroleum and Greenhouse Gas Storage Act 2010 (Vic) adopts the same definition of **petroleum** as is set out in the Commonwealth Act.

By the Underseas Mineral Resources Act 1963 (Vic), the provisions of the Mineral Resources (Sustainable Development) Act 1990 (Vic) are declared to extend and apply to the seabed and its subsoil in Victoria's Adjacent Area.

Section 4(1) of the Mineral Resources (Sustainable Development) Act defines **mineral** and **petroleum** as follows:

Mineral means any substance which occurs naturally as part of the earth's crust –

- (a) including –
- (i) oil shale and coal; and
- (ii) hydrocarbons and mineral oils contained in oil shale or coal or extracted from oil shale or coal by chemical or industrial processes; and

or shale unless occurring in circumstances in which the use of techniques for coal seam methane production or in situ gasification would be appropriate or unless constituting a product of coal gasification (whether produced below or above the ground) for the purposes of production of synthetic petroleum;

Section 6 of the Petroleum Act 1998 (Vic) defines **petroleum** as follows:

- (1) **Petroleum** is –
- (a) hydrocarbon (whether in a gaseous, liquid or solid state); or
- (b) any naturally occurring mixture of hydrocarbons (whether in a gaseous, liquid or solid state); or
- (c) any naturally occurring mixture of one or more hydrocarbons (whether in a gaseous, liquid or solid state), and one or more of the following: hydrogen sulphide, nitrogen, helium or carbon dioxide.
- (2) For the purposes of this Act –
- (a) petroleum includes any petroleum as defined by subsection (1)(a), (b) or (c), and any petroleum product specified by the regulations for the purposes of this section, that has

- (b) any metal, metalliferous substance or mineral recoverable from the sea or a natural water supply; or
 - (c) any metal, metalliferous ore or mineral that has been dumped or discarded –
 - (i) in the course of mining operations or operations incidental to mining operations; or
 - (ii) in other prescribed circumstances; but does not include –
 - (d) soil; or
 - (e) petroleum or any other substance, the recovery or production of which is governed by the Petroleum and Geothermal Energy Act 2000.
- The definitions of **mineral** and **petroleum** in the Mineral Resources (Sustainable Development) Act 1990 (Vic) are set out under Victoria – Offshore Mining.

(Continued)

Continued.

Jurisdiction	Offshore		Onshore		
	Petroleum	Mining	Petroleum	Mining	
		<p>(iii) any substance specified in Schedule 4 (being bentonite, fine clay, kaolin, lignite, minerals in alluvial form including titanium, zirconium, rare earth elements and platinoid group elements, quartz crystals and zeolite);</p> <p>(b) but excluding water, stone, peat or petroleum.</p> <p>Petroleum means –</p> <p>(a) any naturally occurring hydrocarbons, whether in gaseous, liquid or solid state; or</p> <p>(b) any naturally occurring mixture of hydrocarbons, whether in gaseous, liquid or solid state; or</p> <p>(c) any naturally occurring mixture of one or more hydrocarbons, whether in a gaseous, liquid or solid state, and one or more of the following, that is to say, hydrocarbon sulphide, nitrogen, helium and carbon dioxide –</p> <p>and includes any petroleum as defined in (a), (b) or (c) or any prescribed petroleum product that has been returned to a natural reservoir in Victoria, but excludes any naturally occurring hydrocarbon or mixture of hydrocarbons within a deposit of coal or oil shale.</p>	<p>been returned to a reservoir in Victoria; but</p> <p>(b) petroleum does not include any naturally occurring hydrocarbon, or mixture of hydrocarbons, within a deposit of coal or oil shale.</p> <p>Section 69 of the Resources Legislation Amendment (BTEX Prohibition and Other Matters) Act 2014 (Vic) added the following section as s 101A of the Petroleum Act 1998 (Vic) –</p> <p>(1) In addition to any other conditions, an authority is subject to the condition that the use of restricted hydraulic fracturing substances is prohibited in carrying out any hydraulic fracturing permitted by the authority.</p> <p>(2) Despite anything to the contrary in this Act, this condition cannot be varied.</p> <p>(3) In this section –</p> <p>hydraulic fracturing means injection of a substance into a bore under pressure for the purpose of stimulating a geological formation; and</p> <p>restricted hydraulic fracturing substances means fluids or gases used for the purpose of hydraulic fracturing that contains petroleum hydrocarbons containing benzene, ethylbenzene, toluene or xylene in more than the maximum amount prescribed by the regulations.</p>		

NEW SOUTH WALES

Section 4(1) of the Petroleum (Offshore) Act 1982 (NSW) adopts in substance the same definition of *petroleum* as is set out in the Commonwealth Act.

Section 22 of the Offshore Minerals Act 1999 (NSW) adopts the same definition of *mineral* as is set out in the WA Act.

Section 3(1) of the Petroleum (Onshore) Act 1991 (NSW) defines *petroleum* as follows:

Petroleum means

- (a) any naturally occurring hydrocarbon (whether in a gaseous, liquid or solid state); or
- (b) any naturally occurring mixture of hydrocarbons (whether in a gaseous, liquid or solid state); or
- (c) any naturally occurring mixture of one or more hydrocarbons (whether in a gaseous, solid or liquid state), and one or more of the following: hydrogen sulphide, nitrogen, helium or carbon dioxide, and includes any petroleum as defined by paragraph (a), (b) or (c) that has been returned to a natural reservoir but does not include coal or oil shale or any substance prescribed to be a mineral for the purposes of the Mining Act 1992.

Clay/shale, coal, oil shale and structural clay are among the substances prescribed by Schedule 1 to the Mining Regulations 2010 (NSW) to be *minerals* for the purposes of the Mining Act.

The Dictionary at the end of the Mining Act 1992 (NSW) defines *mineral* as follows:

Mineral means any substance

prescribed by the regulations as a mineral for the purposes of this definition, and includes coal and oil shale, but does not include petroleum.

Petroleum has the same meaning in the Mining Act as is given to it in the Petroleum (Onshore) Act.

By virtue of s 3 of the Coal Mine Health and Safety Act 2002 (NSW), *coal* includes oil shale and kerosene shale, but does not include peat, and *methane* includes ethane, propane and similar hydrocarbon gases.

QUEENSLAND

Section 4(1) of the Petroleum (Submerged Lands) Act 1982 (Qld) adopts in substance the same definition of *petroleum* as is set out in the Commonwealth Act.

Section 22 of the Offshore Minerals Act 1998 (NSW) adopts the same definition of *mineral* as is set out in the WA Act, but specifically excludes from the definition coral limestone, sand, gravel and rock.

Section 10 of the Petroleum and Gas (Production and Safety) Act 2004 (Qld) (the 2004 Act) defines *petroleum* as follows:

- (1) *Petroleum is –*
- (a) *a substance consisting of hydrocarbons that occur naturally in the earth's crust; or*

Section 6 of the Mineral Resources Act, 1989 (Qld) defines *mineral* as follows:

- (1) *A mineral is a substance –*
- (a) *normally occurring as part of the earth's crust; or*
- (b) *dissolved or suspended in water on or within the earth's crust; or*

(Continued)

Continued.

Jurisdiction	Offshore		Onshore	
	Petroleum	Mining	Petroleum	Mining
			<p>(b) a substance necessarily extracted or produced as a by-product of extracting or producing a hydrocarbon mentioned in paragraph (a); or</p> <p>(c) a fluid that –</p> <p>(i) is extracted or produced from coal or oil shale by a chemical or thermal process or that is a by-product of that process; and</p> <p>(ii) consists of, or includes, hydrocarbons; or</p> <p>(d) another substance prescribed by a regulation, consisting of, or including hydrocarbons; or</p> <p>(e) a gas, that occurs naturally in the earth's crust, as prescribed under a regulation.</p> <p>However, Section 10(3) of the 2004 Act clarifies the definition of petroleum as follows:</p> <p>(3) To remove any doubt, it is declared that petroleum does not include any of the following –</p> <p>(a) alginite;</p> <p>(b) coal;</p> <p>(c) lignite;</p> <p>(d) peat;</p> <p>(e) oil shale;</p> <p>(f) torbanite;</p> <p>(g) water.</p> <p>The definition of petroleum in s 2 of the Petroleum Act 1923 (Qld) (the 1923 Act) differs in material respects from the definition in the 2004 Act. It provides:</p>	<p>(c) that may be extracted from a substance mentioned in paragraph (a) or (b).</p> <p>(2) Subject to subsection (3), each of the following is a mineral –</p> <p>(a) any type of clay;</p> <p>(b) foundry sand;</p> <p>(c) coal seam gas;</p> <p>(d) limestone;</p> <p>(e) marble;</p> <p>(f) a product that may be extracted or produced by an underground gasification process for coal or oil shale (mineral (f)) and another product that may result from the carrying out of the process (also mineral (f));</p> <p>(g) peat;</p> <p>(h) salt, including brine;</p> <p>(i) oil shale;</p> <p>(j) silica, including silica sand;</p> <p>(k) rock mined in block or slab form for building or monumental purposes.</p> <p>(3) Despite subsections (1) and (2) –</p> <p>(a) clay (other than kaolin and bentonite) is only a mineral if it is mined for use of its ceramic properties; and</p> <p>(b) limestone, silica and silica sand is only a mineral if it is mined for use for its chemical properties; and</p> <p>(c) mineral (f) is only a mineral if –</p> <p>(i) the coal or oil shale, from which it is extracted or produced, is held under a mineral development licence and it has been added to the licence under section 208; or</p>

Petroleum means any –

- (a) naturally occurring hydrocarbons, whether in a gaseous, liquid or solid state; or
- (b) naturally occurring mixture of hydrocarbons, whether in a gaseous, liquid or solid state; or
- (c) naturally occurring mixture of 1 or more of the following –
 - (i) hydrogen sulphide;
 - (ii) nitrogen;
 - (iii) helium;
 - (iv) carbon dioxide;
 and includes any petroleum that has been returned to a natural reservoir; but does not include, and is hereby declared never did include –
 - (d) shale from which mineral oil may be extracted or produced;
 - (e) mineral oil extracted or produced from shale or rock by some chemical or thermal process;
 - (f) shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or the extraction or production of mineral oil therefrom;
 - (g) alginite;
 - (h) coal;
 - (i) lignite;
 - (j) peat;
 - (k) shale or other rock from which a gasification or retorting product defined by the 2004 Act may be extracted or produced;
 - (l) torbanite.

(ii) the coal or oil shale, from which it is extracted or produced, is held under a mining lease and it is specified in the lease.

(d) ... (not presently relevant).

Section 318AC(1) of the Mineral Resources Act defines **coal seam gas** as follows:

Coal seam gas is a substance (in any state) occurring naturally in association with coal or oil shale, if the substance is petroleum under the Petroleum and Gas (Production and Safety) Act.

Section 318AD of the Mineral

Resources Act defines **oil shale** as follows:

Oil shale is shale or rock (other than coal) from which a gasification or retorting product, as defined in the Petroleum and Gas (Production and Safety) Act, may be extracted or produced.

Section 318CM(2) of the Mineral Resources Act defines **incidental coal seam gas** as coal seam gas mined, or proposed to be mined under s 318CM(1). Section 318CM(1) states:

- (1) The mining lease holder may mine coal seam gas in the area of the lease only if –
 - (a) the mining happens as a necessary result of coal or oil shale mining carried out under the mining lease; or
 - (b) the mining is necessary to ensure a safe mine working environment for coal or oil shale mining under the mining lease; or

(Continued)

Continued.

Jurisdiction	Offshore		Onshore	
	Petroleum	Mining	Petroleum	Mining
NORTHERN TERRITORY	<p>Section 4(1) of the Petroleum (Submerged Lands) Act 1982 (NT) adopts in substance the same definition of petroleum as is set out in the Commonwealth Act.</p>	<p>By virtue of s 3(1) of the Coastal Waters (Northern Territory Powers) Act 1980 (Cth), the land of the Territory includes its Adjacent Area and s 5(2) of the Mineral Titles Act 2010 (NT) provides that it applies to all of the land of the Territory.</p> <p>Section 9 of the Mineral Titles Act defines mineral as follows:</p> <p>(1) A mineral is:</p> <p>(a) any of the following naturally occurring substances that is obtainable by mining:</p> <p>(i) an inorganic element or compound (for example, an inorganic carbonate compound);</p> <p>(ii) an organic carbonate compound; or</p> <p>(b) coal, lignite, oil shale or salt; or</p> <p>(c) any other substance prescribed by regulation.</p> <p>(2) However, none of the following is a mineral:</p> <p>(a) an extractive mineral;</p> <p>(b) petroleum as defined in section 5(1) of the Petroleum Act;</p> <p>(c) water;</p> <p>(d) another substance prescribed by regulation.</p>	<p>Section 10(2) of the 2004 Act defines a gasification or retorting product as follows:</p> <p>s 10(1)(c) a fluid that-</p> <p>(i) is extracted or produced from coal or oil shale by a chemical or thermal process or that is a by-product of that process; and</p> <p>(ii) consists of, or includes, hydrocarbons;</p>	<p>(c) the mining is necessary to minimise the fugitive emission of methane during the course of coal mining operations.</p>
			<p>Section 5(1) of the Petroleum Act 1984 (NT) defines petroleum as follows:</p> <p>Petroleum means</p> <p>(a) any naturally occurring hydrocarbon (whether in a gaseous, liquid or solid state); or</p> <p>(b) any naturally occurring mixture of hydrocarbons (whether in a gaseous, liquid or solid state); or</p> <p>(c) any naturally occurring mixture of one or more hydrocarbons (whether in a gaseous, solid or liquid state), and one or more of the following: hydrogen sulphide, nitrogen, helium or carbon dioxide, and includes any petroleum as defined by paragraph (a), (b) or (c) that has been returned to a natural reservoir; but does not include a substance which, in its naturally occurring state, is not recoverable from a well by conventional means.</p>	<p>The definition of mineral in s 9 of the Mineral Titles Act is set out under Northern Territory – Offshore Mining.</p>

TASMANIA

Section 3(1) of the Petroleum (Submerged Lands) Act 1982 (Tas) adopts in substance the same definition of *petroleum* as is set out in the Commonwealth Act.

There is no legislation in Tasmania specifically applicable to offshore mining of minerals

Section 5 of the Mineral Resources Development Act 1995 (Tas) has the following definitions relevant to oil and gas:

Petroleum means any –

- (a) naturally occurring hydrocarbons or mixture of hydrocarbons, whether in a gaseous, liquid or solid state; or
- (b) mixture of one or more such hydrocarbons and gas – but does not include coal seam gas;

Coal seam gas means the gas known as coal bed methane and includes any naturally occurring hydrocarbon, or mixture of hydrocarbons, that is within a deposit of coal or oil shale;

Gas means any naturally occurring hydrogen, hydrogen sulphide, nitrogen, helium or carbon dioxide;

Oil means any natural gas, solid bitumen and mineral oil obtainable by a well, other than –

- (a) mineral oil extractable by the application of heat or chemical process; and
- (b) helium or hydrogen; and
- (c) coal seam gas;

Oil shale means shale containing fossilised insoluble organic matter which will yield liquid or gaseous hydrocarbons on distillation;

Section 5 of the Mineral Resources Development Act has the following definitions relevant to mining:

Mineral means any metallic mineral, non-metallic mineral, industrial mineral, inorganic substance, coal, oil, gas, petroleum, geothermal substance, atomic substance and matter forming part of the crust of the earth, other than –

- (a) the subsoil; or
- (b) the layer of soil sustaining vegetation; or
- (c) any rock, crushed stone, gravel, sand or clay produced on private land for the private use of the owner; or
- (d) mineral water; or
- (e) any mineral produced as a by-product of a mining operation and stored on leased land and not sold not sold or otherwise disposed of to another person;

Category 1 mineral means any –

- (a) metallic mineral; and
- (b) atomic substance;

Category 2 mineral means coal, peat, lignite, oil shale and coal seam gas;

Category 3 mineral means any rock, stone gravel, sand, and clay used in construction, bricks and ceramics;

(Continued)

Continued.

Jurisdiction	Offshore		Onshore	
	Petroleum	Mining	Petroleum	Mining
				<p>Category 4 mineral means any petroleum products, except oil shale;</p> <p>Category 5 mineral means any –</p> <p>(a) industrial mineral;</p> <p>(b) prescribed precious stone; and</p> <p>(c) prescribed semi-precious stone;</p> <p>Category 6 mineral means any geothermal substance;</p> <p>Mining operations means any operations or work carried out on a leased area –</p> <p>(a) to obtain or treat minerals; or</p> <p>(b) to store or contain minerals or waste material generated by mining on that leased area; or</p> <p>(c) associated with mining – and includes production activities in relation to a Category 4 mineral or a Category 6 mineral</p>

^aThe remaining paragraphs of the definition, being paragraphs (e) and (f), deal with the meaning of petroleum for the purposes of the provisions of the Commonwealth Act applicable to pipelines.