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the voice of australia's
oil and gas industry

APPEA Submission: Committee on the Northern Territory's Energy Future – Inquiry into Key Challenges and Opportunities



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THE INQUIRY

The Australian Petroleum Production and Exploration Association is the peak national body representing Australia's oil and gas exploration and production industry. APPEA has more than 85 full member companies exploring for and producing Australia's oil and gas resources. These companies currently account for around 98 per cent of Australia's total oil and gas production and the vast majority of exploration. APPEA also represents over 240 associate member companies providing a wide range of goods and services to the industry.

APPEA welcomes the opportunity to provide input to the Committee's Inquiry into Key Challenges and Opportunities for the Northern Territory's Energy Future.

TERMS OF REFERENCE

The Committee shall inquire into, report from time to time and make recommendations regarding:

- i. the Territory's current energy capability;
- ii. the Territory's probable and proven energy capability;
- iii. the prospect for additional energy resources;
- iv. the future energy needs of the Territory and the continuity of supply;
- v. the most cost effective means of meeting the Territory's energy needs;
- vi. regulatory impacts on the cost of energy insofar as these can be reasonably ascertained.
- vii. alternative sources of energy supply available to the Territory, including oil, gas, coal, uranium, and the renewable energy sources such as hot rock, solar, biofuels, wind and tidal energy;
- viii. emerging technologies and their applicability to the Northern Territory.

The Committee will give priority to its terms of reference insofar as they apply to onshore energy resources.

CALL FOR SUBMISSIONS

The Committee is calling for submissions to its inquiry into key challenges and opportunities associated with meeting the Northern Territory's future energy needs, in particular:

1. Impact of cultural, economic, environmental, geographic, regulatory or other factors on:
 - a. the exploration, development and production of energy producing resources; and
 - b. availability of developed resources for the domestic energy market.
2. Demand and supply-side management strategies and incentive initiatives to improve productivity, cost effectiveness, energy efficiency, consumer and supplier participation in the energy market.
3. Off-grid power generation alternatives for commercial and remote applications, including funding and investment options or the development of emergent and enabling



EXECUTIVE SUMMARY

APPEA's submission to the Inquiry focusses on the cultural, economic, environmental, geographic and regulatory factors impacting investment in exploration, development and production for oil and gas. In regard to these factors, the Northern Territory (NT) is favourably positioned to take advantage of the emerging opportunities created by increasing global energy demand, particularly in Asia. Evidence of this is the significant investment occurring in oil and gas projects both onshore and offshore the NT.

Natural gas in particular is delivering significant economic and environmental benefits to the NT through job creation, energy security and lowering of greenhouse emissions. The Mereenie project near Alice Springs and more recently the Blacktip project near Wadeye have been supplying gas to meet the power generation needs of Darwin and other parts of the NT for almost three decades.

Liquefied Natural Gas (LNG) projects in operation (Darwin LNG) or under construction (Ichthys and Prelude) have provided and will continue to provide significant employment and economic benefits to the Territory for decades to come. The potential development of other oil and gas resources located offshore from the NT or from northern Western Australia could extend the current wave of investment activity and the NT's potentially large shale gas resources are attracting explorers from around the globe.

The oil and gas industry therefore has the potential to further strengthen its position as a major generator of jobs, incomes and growth in the NT. Through its exports of gas, the NT could also make a significant contribution to helping reduce the growth in global greenhouse gas emissions.

Fundamental to this success has been the provision of a competitive and stable investment environment and a commitment to market-based policies. It will be important that these fundamentals be maintained if the Territory is to maximise future oil and gas investment and the benefits it could generate.

To that end a number of challenges will need to be addressed. Calls for market interventions such as domestic gas reservation must continue to be firmly rejected and the industry and the government must continue to work closely to address those policies and programs that are reducing the Territory's cost competitiveness for new investment. This includes the NT Build scheme which as presently structured, is an inefficient and costly means of providing a long service leave benefit for NT construction workers.

The industry and government must also work together to ensure that community confidence in the industry is maintained through regular and mutually constructive community and stakeholder engagement, good operator practice and robust and efficient regulation.

Reputable studies demonstrate that, with appropriate monitoring and robust and transparent regulation in place, shale and tight gas resources can be developed safely and effectively as an economically important additional energy source which could significantly reduce Australia's greenhouse gas emissions.

Companies in Australia are able to rely on decades of experience and operational practices in pursuing opportunities for development of these previously uncommercial natural gas sources.



Industry and government has also been working to ensure that fact-based information reaches the community to enable informed discussion and decision making, including through independent third parties such as CSIRO. This is an important means of countering the extreme opinions and misinformation that has been spread by some groups opposed to natural gas.

In the long term, regulation and community confidence will heavily influence the successful delivery of projects, which are competing for shares of capital within a global environment and are heavily influenced by factors impacting the cost competitiveness of projects.

APPEA hopes that the Inquiry can help properly inform the public debate, policy processes and regulatory efforts within the NT. This submission should be read in conjunction with submissions from APPEA's members which will provide further detail in relation to current and potential natural gas developments.

APPEA would be pleased to provide further information to the Inquiry at the Committee's convenience.

RECOMMENDATIONS

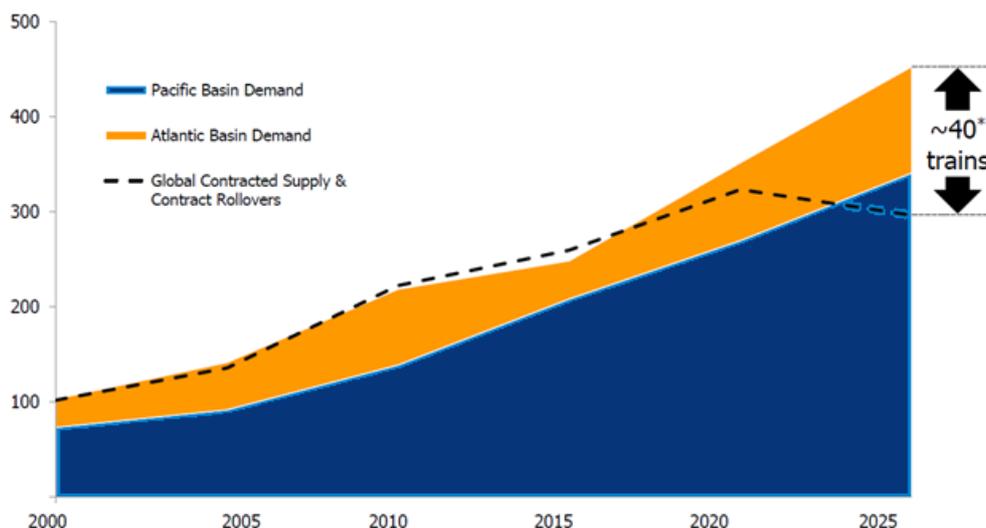
- The Committee endorse the NT Government's rejection of domestic gas reservation and support its focus on gas exploration and development underpinned by the development of an appropriate legislative and regulatory regime for development of the Territory's gas reserves in an efficient and sustainable manner.
- The NT Government ensure the level of resources available to the Energy Directorate of the Department of Mines and Energy keeps pace with the needs of a rapidly growing oil and gas industry and enables it to complete its wide-ranging regulatory reform process in a timely and predictable manner.
- The NT Government improve information sharing and community consultation about its regulatory reform process and the changes being introduced and how these are delivering a regulatory regime that is efficient and effective.
- The NT Government commission an external third party organisation to conduct a full and independent review of the NT Build scheme so as to ensure that it is operating in an efficient and transparent manner. Payments into the scheme should be based on wages paid to NT workers directly engaged in the construction of buildings and production facilities located in the NT.

THE ROLE OF OIL AND GAS IN FUTURE ENERGY MARKETS

Energy is a fundamental enabler of modern societies and lifestyles. Globally, seven billion people use energy each day, making their lives richer, more productive, safer and healthier. The US Energy Information Administration recently projected global demand for energy will increase by 52 per cent between 2010 and 2040.¹ While nuclear and renewable sources will provide increased contributions (2.5 per cent per annum), fossil fuels are expected to supply nearly 80 per cent of world energy needs through to 2040.²

Much of this demand will come from non-Organisation for Economic Cooperation and Development (OECD) countries which are expected to increase their energy demand by 90 per cent during this period (compared to 17 per cent in OECD countries).³ Natural gas will continue to play a critical role in meeting the world's demand for energy, particularly for countries in the Asia Pacific region. The International Energy Agency recently estimated that Southeast Asia's energy demand will grow by over 80 per cent between now and 2035 (a rise equivalent to current demand in Japan).⁴

Figure 1 - Global Liquefied Natural Gas (LNG) Demand and Supply



Source: Santos 2013

Sustained growth in China and continued strong demand in Japan and Korea have driven world energy markets, including gas demand and gas prices. Recognition of the environmental benefits of gas, in particular the contribution it can make to reducing greenhouse gas emissions, is also supporting the growth in gas demand. Gas will continue to be an important part of a diverse, environmentally friendly and affordable energy mix for decades to come.

¹ 'EIA projects world energy consumption will increase 56 per cent by 2040', US Energy Information Administration, (2013) <http://www.eia.gov/todayinenergy/detail.cfm?id=12251> [Accessed 17/09/13].

² Ibid.

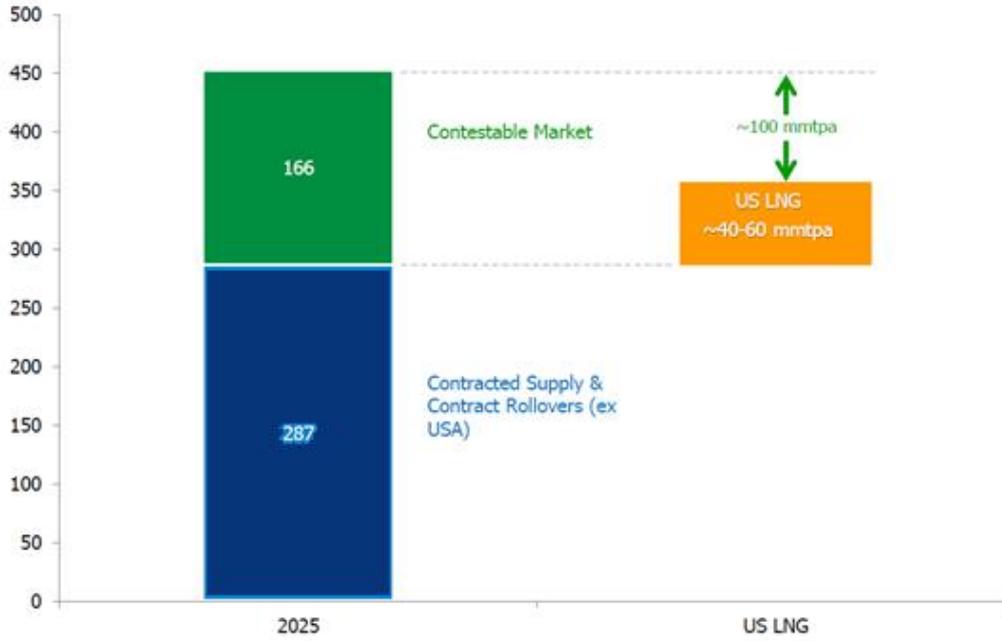
³ Ibid.

⁴ 'Southeast Asia Energy Outlook', International Energy Agency, http://www.iea.org/publications/freepublications/publication/SoutheastAsiaEnergyOutlook_WEO2013SpecialReport.pdf



These factors have changed the dynamics of key international resource, product and capital markets and have encouraged the growth of the Australian gas industry at higher levels than was expected five years ago.

Figure 2 - Global LNG demand vs US LNG Supply in 2025



Source: Santos 2013

To help meet this growing demand, Australia’s LNG production capacity will increase at unprecedented levels to over 80 million tonnes per annum by 2017 at current construction and expansion rates. Almost \$200 billion is currently being invested in oil and gas projects across Australia including seven major LNG projects, which will deliver large economic benefits to the nation. The increased production capacity will propel Australia towards being the world’s second largest LNG exporter behind Qatar.

This expansion is underpinned by Australia’s position at the cusp of a major shift in the world’s economic weight from west to east. The economic advance of our region is overwhelmingly positive for Australia. It plays to our comparative advantages as a secure and reliable energy exporter and our close proximity to key export markets.

Domestically, Australia’s energy demand is expected to increase by 29 per cent between 2008 and 2035. Petroleum products, which represented 39 per cent of energy consumption in 2011-12, will meet most of this demand. Into the future natural gas will continue to supply energy to various industries (e.g. mining), households (e.g. hot water, stove tops) and sectors such as transport (e.g. compressed natural gas bus fleets).



INNOVATION

Over many decades of petroleum developments, the industry has employed innovative solutions to respond to cost pressures and technically challenging environments. Cost effective technologies have been developed by the industry to both extract gas and get it to where it needs to go. The development of LNG technologies made natural gas available to more distant markets that were not previously able to be reached by pipeline. This helped globalise trade in natural gas, opening up new markets around the world. This can also be seen in the evolution of technologies such as FPSO vessels and trans-continental pipelines.

More recently in the United States, the application of horizontal drilling and hydraulic fracturing techniques has enabled the extraction of natural gas from shale rock formations at a competitive cost. In 2000, shale gas provided only one per cent of U.S. natural gas production; by 2010 it was over 20 per cent and the US government's Energy Information Administration predicts that by 2035, 46 per cent of the United States' natural gas supply will come from shale gas.

The driving force behind this shift is that it has become economically feasible to extract unconventional sources of gas that were previously considered inaccessible. The use of horizontal drilling has become a standard industry practice since the first true horizontal oil well was drilled in the 1920s. Whereas a vertical well allows access to tens or hundreds of metres across a flat-lying formation, a horizontal well can be drilled to conform to the formation and can therefore extract gas from thousands of metres of shale.

However, horizontal drilling alone would not have enabled exploitation of the unconventional gas resources because the reservoir permeability is not sufficient to achieve economical gas production by natural flow. Hydraulic fracturing was developed in the 1940s to fracture and increase permeability of target formations and has since been improved to match the characteristics of specific types of reservoirs, including shales.

It was the combination of these two technologies that led ultimately to the shale gas "revolution" in the United States. While other factors were present (pipeline infrastructure, proximate large domestic market, large local services sector), a recent review of the emergence of shale gas development in the US found that of all the factors that converged in the early 2000s to make it profitable for firms to produce large quantities of shale gas, the most important was technology innovation.

Contrasted with energy shortages in Europe, the success of the US experience has led some to conclude that "governments must support the realities of economics and technology." Chatham House recently summed up the current climate for energy projects when it stated that "the oil



and gas industry is more competitive than ever”⁵. Within this environment of high competition, oil and gas companies have also been forced into more challenging environments to develop energy resources to meet the world’s demand. Research by Wood Mackenzie indicates that more than half of the international global oil and gas companies are focusing on long-term capital investments in deepwater, shale/tight oil, shale gas and oil sands.⁶

It has therefore become critical for companies to innovate and push the technological evolution of the industry. Another example of this is the development of Floating LNG (FLNG) in response to cost and technological barriers.

Developments in technology, including advances in drilling and hydraulic fracturing and the advent of FLNG, are critical to the future of the industry and to host regions such as the NT. Advances in drilling technology are enabling the Territory’s deep shale resources to be accessed and Darwin is set to become a major supply base to FLNG projects under construction or being planned in Australia’s northern waters.

THE NORTHERN TERRITORY’S ENERGY FUTURE

The NT has significant potential oil and gas resources located in both onshore and offshore basins. There is no material difference between the composition of natural gas retrieved from conventional sources (e.g. the gas exported through the Darwin LNG project) and natural gas from shale or tight rock sources. The key difference between “conventional” and “unconventional” natural gas is the manner, ease and cost associated with extracting the resource.

Offshore

Offshore fields considered potential sources of supply for the NT include the Bonaparte and Browse Basins, which are estimated to contain 25tcf of economically recoverable gas⁷ and 1287 petajoules of crude oil resources⁸.

Significant existing petroleum developments include:

- ConocoPhillips Darwin LNG. Construction of the Darwin Liquefied Natural Gas (LNG) plant in the NT began in June 2003, with the plant being officially commissioned in January 2006. Gas is sent via a 500 kilometre pipeline from the Bayu-Undan field to the plant at Wickham Point, where it is converted into LNG for sale to Tokyo Electric and Tokyo Gas in Japan. The plant has

⁵ Chatham House, John Mitchell, *What Next for the Oil and Gas Industry?*, October 2012, P. 64

⁶ The Wall Street Journal, Guy Chazan, *Big Oil Heads Back Home*, 5 December 2011, available at: <http://online.wsj.com/article/SB10001424052970204479504576638731600191382.html>

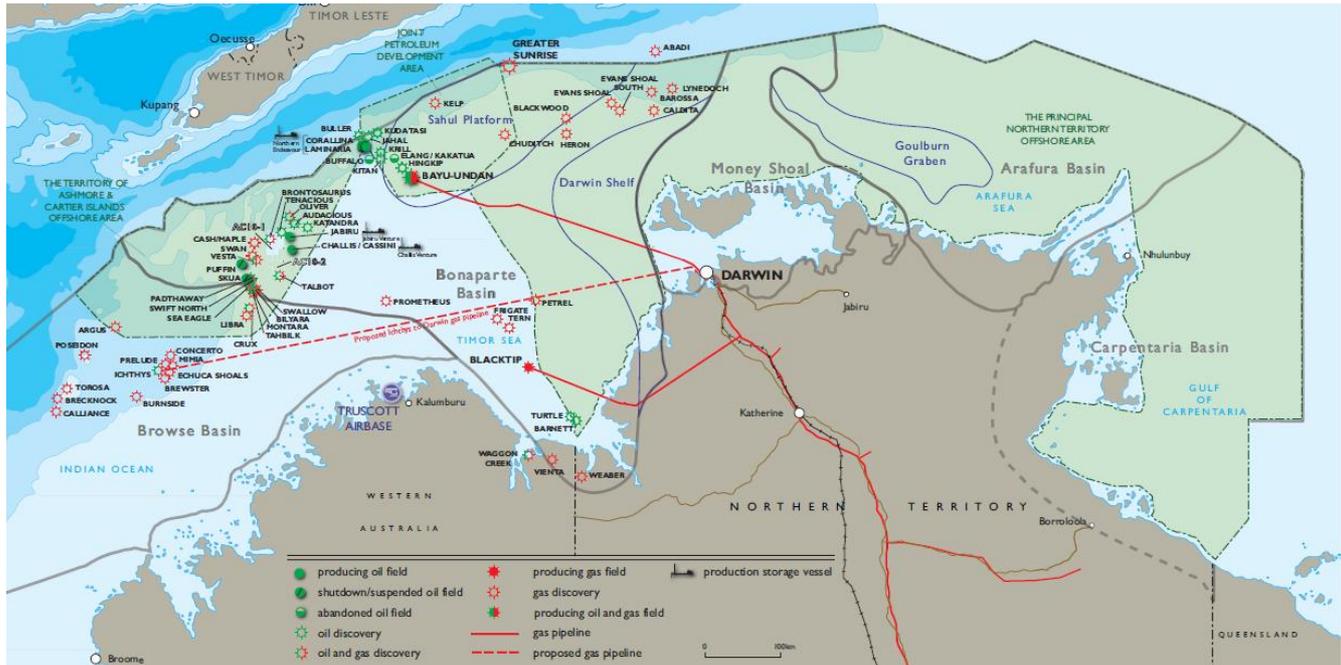
⁷ Geoscience Australia, ‘Australian Gas Resource Assessment’, http://www-a.ga.gov.au/web_temp/1493319/AustralianGasResourceAssessment2012.pdf, P. 14.

⁸ Geoscience Australia, ‘Australian Energy Resource Assessment’, http://www.ga.gov.au/image_cache/GA16725.pdf, P. 52.



a capacity of 3.5 mtpa and more than 300 LNG shipments have been delivered from the facility since early 2006.

- Eni Blacktip field. The Blacktip Gas Plant is situated approximately 240km from Darwin near Wadeye with the unmanned platform located approximately 110 km offshore in the Joseph Bonaparte Gulf. The Blacktip Project, which is 100 per cent owned and operated by Eni, has been delivering gas to the NT for power generation since September 2009.



Projects currently under development include:

- INPEX Ichthys*. Exploration conducted by INPEX in 2000-01 resulted in the discovery of the Ichthys gas and condensate field, approximately 200 kilometres northwest of Western Australia. The field has attracted a high level of interest from international investors with French and Japanese companies holding 30 and 70 per cent interests in the project respectively.

In September 2008, the joint venture selected Darwin as the site for the project's onshore LNG processing facility. The project achieved a final investment decision in January 2012, with an associated capital expenditure of US\$34 billion for its development. Construction of the LNG plant in Darwin commenced in April 2012 and the project is scheduled to commence production in 2016. It is expected to produce 8.4 mtpa of LNG from two trains, 1.6 mtpa of LPG and at peak, 100,000 barrels per day of condensate.



The Ichthys LNG Project is providing a major economic stimulus to the NT economy. The construction workforce is expected to peak at more than 4,000 people during 2014-15 and the project is generating employment and business opportunities among NT-based suppliers. The project has committed to full, fair and reasonable opportunity for Australian industry through entering into a comprehensive Industry Participation Plan (IPP) with the NT Government. The IPP promotes participation by Territory and Australian-based companies and to date more than 130 NT-based businesses have secured 170 contracts or supplier purchase orders. The IPP is also focussed on encouraging Aboriginal and Torres Strait islander businesses and that effort is also showing positive results.

The project has also helped to fund training in the NT with an A\$3 million investment in the construction of the Larrakia Trade Training Centre. A further A\$3 million was provided to establish the North Australian Centre for Oil and Gas at Charles Darwin University.

Infrastructure associated with the project will provide long-term benefits for the NT well beyond the completion of the current construction phase, such as the \$22.5 million spent to date to improve community road infrastructure and safety. Over coming decades the Territory will also benefit from ongoing operational and maintenance expenditure.

- *Shell Prelude*. Located 475 kilometres north-north-east of Broome in Western Australia, the Prelude and Concerto fields are relatively small with a combined resource of approximately 3tcf of gas. The size and location of these fields mean they are perfect candidates for the first implementation of Floating LNG anywhere in the world. The deployment of this leading-edge technology will result in significant flow-on benefits through employment, research and development. The Prelude FLNG facility will process 3.6 million tonnes per annum of LNG, as well as condensate and LPG, on a floating facility positioned directly over the gas field. Products will then be loaded at sea and exported direct to customers. Shell has identified Darwin as the supply base for Prelude to support the maintenance requirements of the offshore FLNG facility.

Other potential projects include:

- *Woodside operated Sunrise Project*. The Sunrise and Troubadour gas and condensate fields, collectively known as the Greater Sunrise fields, are located approximately 150 km south-east of Timor-Leste and 450 km north-west of Darwin. The fields were discovered in 1974 and hold a total contingent resource of 5.13 Tcf of dry gas and 225.9 million barrels of condensate. According to the International Unitisation Agreement (IUA) signed by Australia and Timor-Leste, approximately 20 per cent of the Greater Sunrise fields are attributed to the Joint Petroleum Development Area (JPDA), which is jointly administered by the governments of Australia and Timor-Leste, with the remaining 80 per cent attributed to Australia.
- *Bonaparte LNG*. The Bonaparte LNG Project is a joint venture between GDF SUEZ Bonaparte (60 per cent) and Santos (40 per cent). The proponents are working to develop a floating liquefaction project in the Timor Sea, 250 kilometres west of Darwin. The Project aims to



produce Liquefied Natural Gas (LNG), using natural gas from the three remote offshore fields, Petrel, Tern and Frigate.

The Project is currently in the pre-Front End Engineering and Design (FEED) phase of development and is expected to enter FEED in 2014, with the Final Investment Decision scheduled for 2015. Commonwealth environmental approval was received in October 2012.

- *Tassie Shoal LNG*: The Tassie Shoal LNG Project offers a commercialisation option for the remote and currently stranded gas fields in the region. Fully owned by MEO Australia, this plant, in conjunction with the proposed Tassie Shoals methanol project is adjacent to Herron and Blackwood discoveries.

Other offshore discoveries and ongoing exploration activity could result in a range of longer-term development opportunities:

- In 2013 the Commonwealth announced the award of new permits for exploration in both the offshore Browse and Bonaparte Basins. MEO Australia picked up a permit immediately south of the producing Blacktip gas field and have forecast a spend of \$20 million over the permit term, while Woodside, INPEX, Pathfinder Energy and IPM West Pty Ltd also picked up acreage.
- Acreage is also currently open for bidding in the 2013 offshore release with four areas in the Ashmore-Cartier, five in NT offshore and three in Western Australia in the Browse basin. These numerous areas were strongly supported by industry nominations indicating the high level of interest in northern Australia territorial waters.
- This level of interest builds on the drilling activity of the last two years which has seen finds by ConocoPhillips and Karoon (Boreas-1, Zephyros and Proteus-1 discoveries), TOTAL (Bassett West) and Santos (Crown-1). These have the potential to support multi-billion investments in additional LNG trains for the Darwin LNG or Ichthys LNG projects or additional gas for commercialisation through Prelude FLNG (Shell) or Bonaparte LNG (GDF Suez/Santos).
- As yet undeveloped offshore discoveries such as Barossa (drilled in NT/P69 in 2006), Caldita (NT/P61 in 2007) are awaiting Joint Venture (ConocoPhillips, Santos and SK E&S) approval to proceed with an appraisal drilling program planned to commence in 2014.
- Eni and MEO are engaged in a drilling program to appraise the Heron and Blackwood (NT/P68) discoveries after which development options will be considered.

Onshore

Santos has been producing oil and gas from the Mereenie field west of Alice Springs since 1984 (oil) and 1987 (gas). Oil is currently trucked south to Port Bonython, whereas gas is reinjected into the main oil production reservoir while new gas sales contracts are actively being sought. In



April 2013 Santos committed to a \$100 million drilling and appraisal program over Mereenie targeting oil and evaluating natural gas in the sparsely drilled western and central areas of the field.

Also in the Amadeus Basin, the Palm Valley and Dingo gas fields are wholly owned and operated by Magellan Petroleum. The Palm Valley field has been in production since 1983 using the Amadeus-Darwin gas pipeline to transport gas to its customers in the NT. The Dingo gas field was discovered in 1981 and development has commenced following the recent signing of a long-term gas sales agreement with Power and Water Corporation for the sale of up to 31 PJ of gas (30 Bcf) over a 20-year period from 2015.

While to date the NT has been reliant on the production of gas from conventional sources, the Territory is also believed to contain large unconventional resources in the form of shale gas and potentially shale oil. Shales are fine-grained sedimentary rocks formed from the compaction of silt and mud. 'Tight' rocks are typically limestone and sandstone. Both shale and 'tight' rocks have very low levels of permeability and are found deep underground, typically at depths of between two and five kilometres.

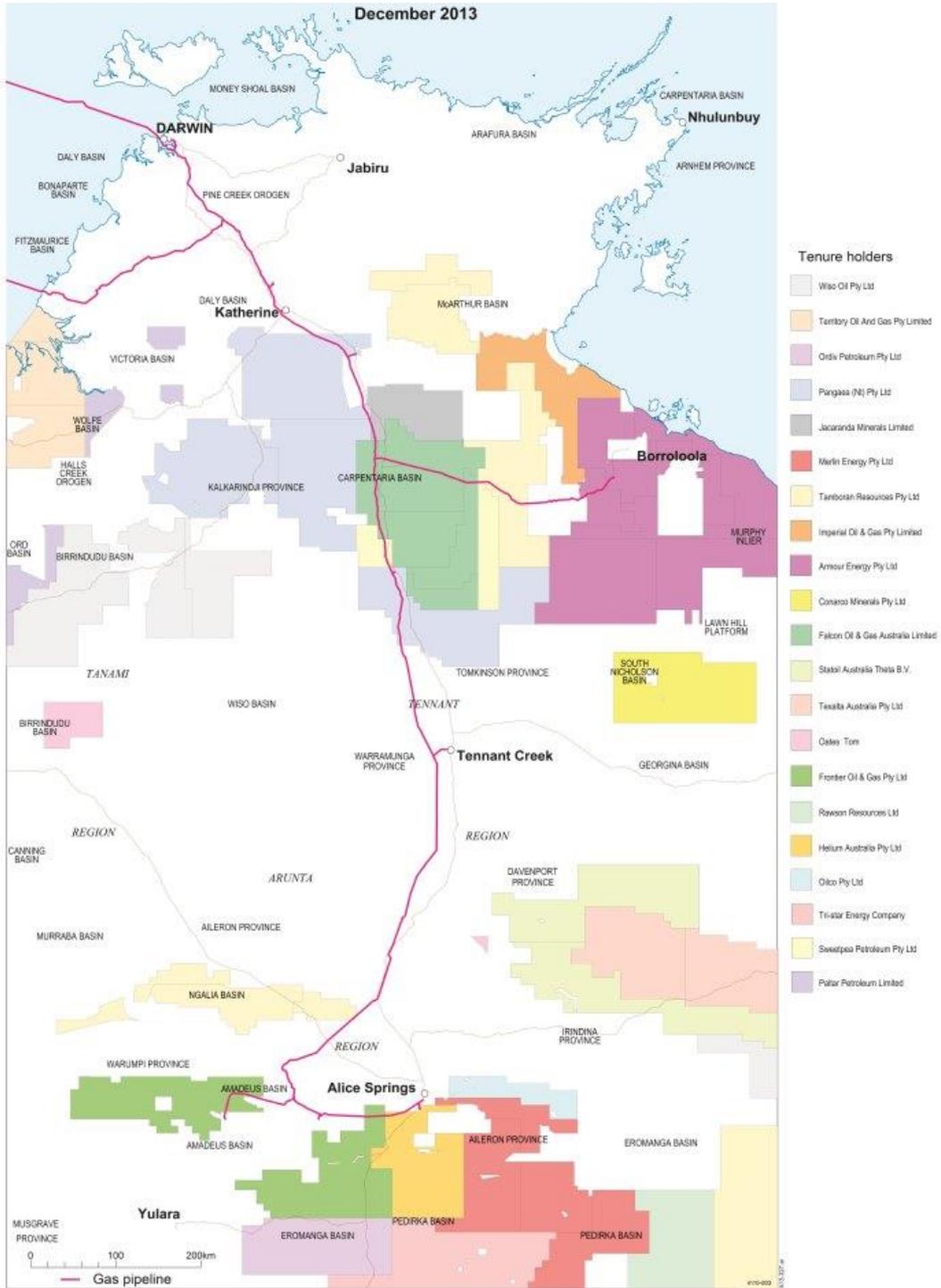
Estimates from the US Energy Information Administration have suggested that Australia could possess recoverable resources of 17.5 billion barrels of shale oil and condensate and 437 Tcf of shale gas.⁹ These equate respectively to the sixth and seventh largest global reserves of shale oil and gas. The NT's share of this is 56 Tcf of risked recoverable with 262 Tcf of potential shale gas possible. As noted by the EIA, these estimates are uncertain given the relatively sparse data that currently exist and more exploration will need to be undertaken to determine whether these figures are indicative. They also do not account for some of the other shale basins where gas has been discovered and is currently under appraisal.

As indicated in Figure 3 exploration for shale oil and gas is currently being focussed on the Macarthur, Bonaparte, Beetaloo, Georgina and Amadeus Basins. Exploration activity is still at relatively low levels with less than a dozen deep shale wells drilled to date in the NT. Most of the exploration activity during 2013 has been in the form of geotechnical studies and seismic programs. However, drilling activity is expected to increase in 2014 with plans for up to a dozen wells to be drilled across the Territory. Not all of these will be extended horizontally or hydraulically fractured.

⁹ Based on the risked recoverable levels of the Georgina, Beetaloo, Maryborough, Canning and Cooper Basins. See 'Technically recoverable shale oil and shale gas resources', US Energy Information Administration (2013), <http://www.eia.gov/analysis/studies/worldshalegas/> [Accessed 17/09/13].



Figure 3 - Petroleum Explorers in the NT



Source: NT Department of Mines and Energy



The Georgina Basin is a region of proven oil potential with target horizons ranging from 300 metres (m) to 1000 m. It is a sparsely explored green field area which has all the attributes of a productive hydrocarbon province.

The Beetaloo Basin, located around 500 km southeast of Darwin, has been identified as one of the few remaining virtually unexplored, onshore sedimentary basins in the world. The basin is more than 3000 m thick and there is evidence that both unconventional and conventional hydrocarbons are present. The current pipeline is too small to be of any significant use for the transport of gas and would need to be looped or duplicated. Petroleum liquids could be transported by road or rail.

The McArthur Basin is a petroleum frontier basin with indications of oil and gas although no prior shale gas exploration or production activity. The target for shale gas is predominantly the Barney Creek and equivalent formations which have both conventional and unconventional prospects. Additionally, the Velkerri Formation within the Roper Group has also shown potential for significant gas volumes. There is an existing 700 km pipeline from the McArthur River to Darwin and access to the Carpentaria Highway. The NT and Australian Governments are considering the development of a gas pipeline from Katherine to Gove that follows the Central Arnhem Highway.

Recent exploration by Armour Energy in the southern McArthur basin has reported significant finds of gas in the Glyde Sub-basin and Barney Creek formations. Modelling and field work conducted by Imperial Oil & Gas in conjunction with the Adelaide Research Institute has found that large portions of the middle and northern McArthur basin are highly prospective for both oil and gas. This research has been supported by recent exploration by Armour Energy. Further modelling and mapping work has identified high potential for oil and gas between the Arafura sea in the North to the Carpentaria Highway in the south over an area of approximately 35,000 km².

BENEFITS OF OIL AND GAS

Economic Benefits

The petroleum exploration and production industry is an integral part of the Australian economy. The industry's direct contribution includes:

- the supply of reliable, clean, efficient energy supplies for households and industry;
- employment of tens of thousands of Australians;
- regional investment;
- export income (and the replacement of imports); and
- the payment of significant amounts of government tax revenues (on average, more than \$7 billion per annum over the last five years).



In addition, substantial indirect benefits flow from the industry, including to the national, state and NT economies via a growing services and contractor sector. Reliable, secure and competitively priced energy is crucial to industry, our communities and households. It underpins Australia's economy and industrial structure. Within this framework, oil and gas plays a key role. In 2012-13, petroleum (oil and gas) accounted for 55 per cent of Australia's primary energy consumption and this is projected to increase to 80 per cent in 2049-50.¹⁰

The construction of seven LNG projects in Australia is expected to increase GDP by up to 2.2 per cent a year and require a construction workforce peaking at over 100,000 full-time equivalent jobs. By 2025, the construction and operation of these projects will add more than \$260 billion to Australian GDP and contribute between \$7.9 billion and \$12.1 billion a year in taxation revenue. This is just the contribution of the first wave, only considering currently committed and under construction projects.

Once operational, these projects will also help reduce the growth in Australian and global greenhouse gas emissions, improve Australia's energy security and increase the competitiveness of our energy markets. They will also provide a long-term boost to jobs and income for service industries and tax revenues for governments.

There is also \$180 billion of investment in the planning stage, and bringing this investment to operational fruition would benefit the entire nation: GDP would increase by 1.5 per cent and approximately 150,000 jobs would be created¹¹.

The development and availability of natural gas will have broad benefits, as demonstrated by the recent and rapid transformation of the North American energy sector which has significantly bolstered the US economy. The global forecaster IHS recently found that the resurgence in onshore gas and oil in the US had created at least 1.7 million jobs across the US in 2012 with estimated growth to 2.5 million jobs by 2015.¹² The US shale gas industry has generated US\$63 billion in government revenues and this is expected to increase to US\$113 billion by 2020.

While these figures are derived from a very mature and likely significantly larger industry than the NT will see, the US experience has demonstrated that benefits can flow to adjacent states that have little or no production in addition to those that host the industries. Large economic contributions have been seen through the delivery of critical goods and services that are vital to the oil and gas supply chain.¹³

¹⁰ 'Energy Projections to 2050', Bureau of Resources and Energy Economics (2012). See <http://bree.gov.au/documents/publications/aep/Australian-Energy-Projections-to-2050.pdf>

¹¹ McKinsey & Co (2013), *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, May (available at www.mckinsey.com/locations/australia/knowledge/pdf/extending_lng_boom.pdf).

¹² 'America's New Energy Future – The Unconventional Oil and Gas Revolution and the US Economy', IHS Global Insight (2013), <http://www.ihs.com/info/ecc/a/americas-new-energy-future-report-vol-2.aspx>, [Accessed 17/09/13]

¹³ Ibid.



A similar success story has been seen in Australia with Queensland's coal seam gas industry identified as a significant contributor to the State's economy through job creation. Data obtained from APPEA members indicates that more than 27,000 people were employed in Queensland's CSG industry during the fourth quarter of 2012.

Between January 2011 and Q4 2012, economic flows from the CSG industry to Queensland communities was valued at over \$97 million. While offshore LNG projects are generally an order of magnitude beyond a shale or tight gas project in terms of scale, they do provide an indication of the type of community benefits that can flow from energy developments.

In Western Australia, the offshore oil and gas sector has been operating and supporting local communities in the State's north-west for over 25 years, including significant investment in community infrastructure and social initiatives across the region.¹⁴ For example, the North West Shelf project currently spends approximately \$600 million per annum with Australian-based businesses for operational activities. Similarly, the Apache-operated Devil Creek domestic gas project has reported annual payments to Australian-based businesses of \$1.4 billion.

It is anticipated that the Ichthys LNG Project will increase NT Gross State Product by almost 18 per cent per annum, growing the NT economy to 7.6 times its current size over the life of the Project. It will increase export income by A\$1.8 billion per annum and Australian GDP by 0.2 per cent per annum. The project will also pay Petroleum Resource Rent Tax (PRRT), income tax and other charges and duties to Australian Governments over the life of the Project.¹⁵

As at 30 June 2012, INPEX had spent approximately A\$5.0 billion with Australian-based businesses on the construction of the Ichthys LNG Project.

Darwin-based suppliers are not only gaining business from this and other oil and gas projects but have also captured significant volumes of work from projects in Queensland and Western Australia (in some cases this now accounts for most of their business). These types of improvements to the capacity and competitiveness of the NT's oil and gas services sector, without government subsidies or assistance, will deliver large, long-term benefits to the NT and Australian economies.

In addition to the economic activity generated from these projects, the energy sector also has a history of supporting projects within the communities in which they operate, including investment in infrastructure, education and research (e.g. health and environmental). The development of a shale and tight gas industry in the NT would have significant social and economic benefits depending on the location, speed, scale, duration and configuration of new project developments.¹⁶ A landmark report by the Australian Council of Learned Academies

¹⁴ 'The wider contribution to Australia of the Oil and Gas Industry', Australian Venture Consultants (2012), P. 15.

¹⁵ *Ibid.*

¹⁶ ACOLA. P. 153



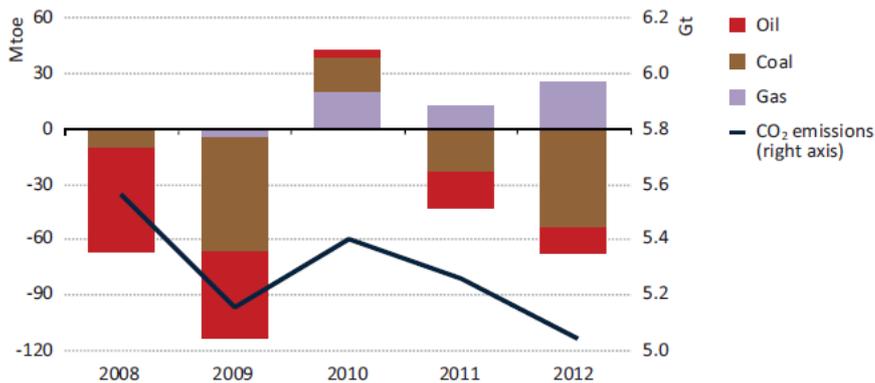
(ACOLA) notes that economic diversification that leverages energy projects is the best way of contributing to the long-term wellbeing of a region. The NT onshore gas industry has the potential to expand and diversify economies in regional areas now faced with limited growth opportunities and to provide an alternative source of income for pastoralists and indigenous communities (through community development programs, local contract work and employment opportunities).

Environmental Benefits

The development of a shale and tight gas sector has the potential to provide a number of positive environmental benefits. In June 2013, the International Energy Agency (IEA) released a report noting that emissions from the United States had fallen by 3.8 per cent (200 million tonnes) over the previous year. In total, US emissions have fallen between 400 and 500 million tonnes – twice the reduction achieved in the rest of the world as a result of the Kyoto Protocol.

The IEA attributed this fall to the increased uptake of natural gas, in particular from shale sources, which replaced coal in power generation, as indicated in Figure 4 below.

Figure 4 - Change in fuel consumption and total energy-related CO₂ emissions in the US



Source: IEA¹⁷

Natural gas currently offers the cleanest viable source of baseload and peaking power in Australia. This is supported by evidence out of the US which highlights falling carbon emissions as a result of the uptake of shale gas. Within Australia it is expected that increased access to shale and tight gas would likely decrease the contribution of coal-fired generation (as happened in the US) to the electricity mix.¹⁸ This conclusion has also been supported by a recent study from the UK

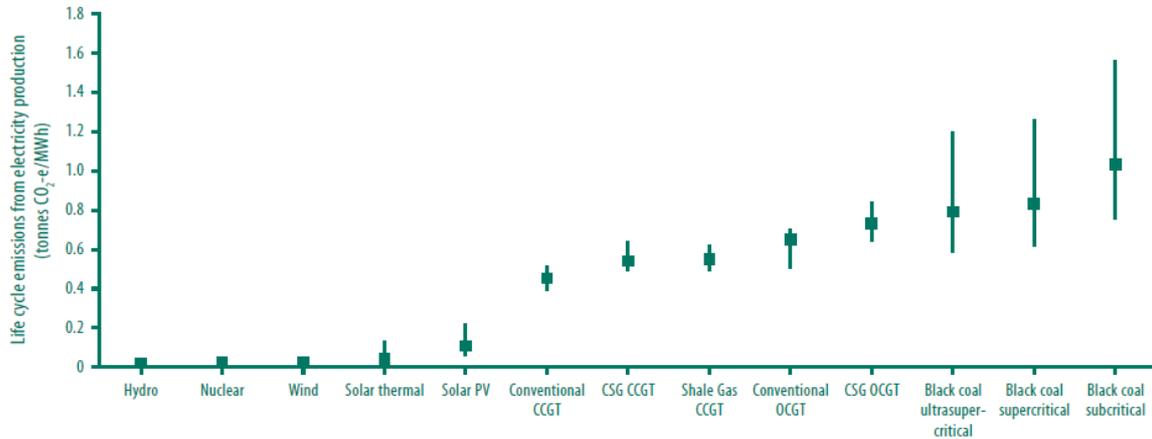
¹⁷ 'Redrawing the energy-climate map', International Energy Agency (2013), <http://www.worldenergyoutlook.org/media/weowebiste/2013/energyclimatemap/RedrawingEnergyClimateMap.pdf>, [Accessed 17/09/13].

¹⁸ ACOLA. P. 17



Department of Energy and Climate Change and the ACOLA report in Australia, as illustrated in Figure 5 below.¹⁹

Figure 5 – The range of life cycle emissions for electricity generation (tonne CO₂e/MWh)



Source: ACOLA

Some critics of natural gas, in particular the increased use of shale and tight gas, have made clear their opposition to the industry because it delays the transition to renewable energy.²⁰ This argument ignores the evidence and experience in the US for example, which show that natural gas provides the quickest, most economically efficient and reliable opportunity to reduce Australia's carbon emissions.

The scale and benefits of shale and tight gas developments will vary from region to region but will need to be supported by effective strategic planning to ensure impacts are minimised, benefits are maximised and coexistence is maintained.

The Roundtable for Unconventional Gas in South Australia hosted by the Department of Manufacturing, Industry, Trade, Resources and Energy is a good example of such a planning process. Such planning, when supported by communication, information sharing and transparency, ensures that the benefits to the community from a potential industry are maximised (including components of projects such as surface infrastructure).²¹

¹⁹ MacKay, D, Stone, T, 'Potential Greenhouse Gas Emissions Associated with Shale Gas Extraction and Use', Department of Energy and Climate Change (2013), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/237330/MacKay_Stone_shale_study_report_09092_013.pdf, [Accessed 17/09/13].

²⁰ "There's no contest: we shouldn't be burning either gas or coal. Instead, we should leave them in the ground, and move towards renewable sources of energy." 'Climate Change and Fracking', Clean Water Health Land (2013), <http://cleanwaterhealthyland.org.au/content/climate-change>, [Accessed 17/09/13].

²¹ ACOLA. P. 154



SHARED OBJECTIVES AND CHALLENGES

INFRASTRUCTURE

The availability of infrastructure will have a significant bearing on the extent and pace of development of the NT's onshore oil and gas resources. To get products to market, oil projects will require road access while gas projects will require significant investment in new pipelines and expansions of existing pipelines. Remote area developments will also require significant investment in other economic and social infrastructure such as airports, communications, health, education and housing in remote communities. To help the Government understand and plan for these requirements the Department of Transport has recently commenced work on a long-term NT Regional Infrastructure Study. APPEA welcomes this work, as without adequate infrastructure it will be very difficult to economically develop remote gas resources for supply into local and potentially more distant markets interstate and overseas.

The \$110m Marine Supply Base to be established at East Arm Wharf is an example of the proactive and positive approach taken by the Northern Territory Government to support industry development. This facility will play a key role in delivering operational efficiencies to oil and gas projects and is an example of the Territory putting assets in place to service a global industry.

MARKET-BASED POLICIES

At a national level, the 2012 Energy White Paper²² established a solid policy framework to guide the sector's long-term development. The White Paper clearly articulates the important role that Australian natural gas will play in delivering economic growth and energy security. It also recognises the critical importance of market-based energy policies and sends an important signal to investors in its rejection of domestic gas reservation policies and other such industry protection measures.

Arguments for domestic gas reservation are short-sighted and self-interested. Gas reservation policies actually impair local gas supply and affordability, rather than improve it. Laws that dictate where and how gas can be sold invariably deter the very investment needed to develop Australia's abundant gas reserves.

LNG projects, to which Australia now looks to underpin the national economy for decades to come, are complex, extremely costly and require a decades-long horizon.

²² Available at www.ret.gov.au/energy/facts/white_paper/Pages/energy_white_paper.aspx.



Australia's LNG industry is a source of comparative advantage that should be harnessed, not hindered. It is delivering substantial, economy-wide benefits in terms of investment, jobs, and regional development. But for this benefit to be sustained, governments must resist calls for policy interventions that force non-commercial outcomes.

Just as Australia's long-term national interest is served by maintaining access to open and competitive markets for wine, coal, wheat, and iron ore, the same is true for gas.

APPEA has therefore welcomed the NT Government's announcement on 16 April 2013²³ that it will not introduce a gas reservation policy. As the Chief Minister noted:

... a gas reservation policy would only stifle business and reduce investment opportunity.

Recommendation

- The Committee endorse the NT Government's rejection of domestic gas reservation and support its focus on gas exploration and development underpinned by the development of an appropriate legislative and regulatory regime for development of the Territory's gas reserves in an efficient and sustainable manner.

COST PRESSURES AND FISCAL STABILITY

The oil and gas industry is national in scope with cost pressures and fiscal stability an issue for national as well as Territory Governments. This section outlines the overall issue and finishes with some specific commentary on the NT role.

The major challenge to continued growth and the realisation of the full potential of Australia's oil and gas resources is maintaining Australia's international competitiveness in the face of growing global competition. Australia is a high cost local environment and the emergence of new LNG competitors in East Africa, North America and elsewhere will make it much harder to win market share and attract investment than has been the case over recent years.

The industry and governments must also do everything possible to ensure that projects under construction commence production in a timely manner while managing and minimising the risks to safety and the environment. Some impacts on current and future investment, such as the high Australian dollar, are beyond the ability of industry to influence. However, other key challenges to competitiveness must be addressed.

²³ Giles MLA, The Hon Adam (2013), "No Gas Reservation Policy", *Media Release* (available at newsroom.nt.gov.au/index.cfm?fuseaction=viewRelease&id=10639&d=5).



In particular, the industry and its suppliers need to work harder at constraining cost growth and to meeting skilled labour requirements. Industry is investing in technology and reducing costs through modularisation and innovative procurement processes. But there are critical policy areas that require genuine reform across five priority areas:

Fiscal stability – to provide stable and predictable fiscal settings that recognise the investment risks associated with long-term investment

Taxation settings must provide long-term financial stability while genuinely addressing impediments to competitiveness and distortions to investment. A stable, predictable and competitive taxation regime is essential to underpin the exploration and development investments required to maximise oil and gas production.

Market-based energy policy – to deliver competitive, reliable, cleaner energy through the operation of open and competitive markets

As noted above, the Australian Government's Energy White Paper establishes a solid policy framework to guide the long-term development of the industry. It clearly articulates the important role that Australian natural gas will play in delivering economic growth and energy security, both domestically and throughout our region. It recognises the critical importance of market-based energy policies and sends an important signal to investors in rejecting domestic gas reservation policies. It now needs to be implemented as a wide-ranging reform agenda that addresses all of the major impediments to industry competitiveness and investment. This is a task that governments in collaboration with industry must pursue if the wealth generation potential of Australia's oil and gas resources is to be fully realised.

Maintaining industry access to resources – oil imports are increasing rapidly while much of Australia remains unexplored. Frontier exploration needs to be better incentivised.

Australia's oil production is steadily declining. The growing gap between Australia's liquids production and consumption could be greatly reduced by attracting more exploration to the 70 per cent of our prospective basins that remain unexplored. Better fiscal and licensing terms are needed to attract exploration to high-risk, high-cost frontier areas.

Reducing red and green tape – increasing regulation is harming Australia's reputation and deterring investment.

Regulatory uncertainty and costs are increasing rapidly and new requirements are constraining industry activity. More must be done to reduce red and green tape, streamline approvals processes and eliminate duplicative and overlapping regulatory processes (between Australian Government departments and agencies and between the Australian and state/territory governments).

Viable labour markets are essential – ensuring labour mobility, flexibility and productivity is key.



Finding and developing the skilled workforce and local industry supply capability needed to build and operate all of the projects now under construction is a major challenge. Governments, the training sector, suppliers and project proponents all need to contribute towards the development of the required capabilities. The decline in labour productivity growth that Australia has experienced over recent years needs to be reversed. Falls in labour productivity in the resources sector will be arrested as projects now under construction commence production. However, low rates of productivity growth in the crucial construction sector will not automatically recover and need reform.

Australia's high labour costs and lower labour productivity means the cost of construction work on remote Australian resources projects can be up to five times the cost of construction work on the US Gulf Coast. Construction costs for Australian LNG projects, in terms of dollars per installed tonne of capacity, are the highest in the world. Policies to encourage greater mobility of workers to the regional areas of Australia where the demand is greatest, continued access to overseas labour pools for shortages of skilled workers and increased investment in training and up-skilling of the workforce are critical.

Role of the NT

While primary responsibility for these policy areas may rest with the Australian Government, the NT Government has a role to play in working with the national and state governments to ensure that its interests are recognised as reform agendas are developed and implemented. There are also some specific impediments to investment that fall within NT responsibility.

APPEA welcomed the Chief Minister's announcement on 11 September, repeated in subsequent government statements, about the Territory being "open for business". We and no doubt other industry groups, now look forward to working with the government towards the implementation of that commitment. This will require a joint approach by industry and government to identify and address those factors that are undermining the Territory's competitiveness for investment. In particular, those areas of government and industry activity which are unnecessarily adding to industry costs or increasing investment risk.

NT Build

One program which on both counts requires significant and urgent reform, is the NT Build scheme. Intended to provide long service leave payments for construction workers, the scheme is effectively operating as a poorly defined and administered tax on investment. This is because payments by project developers under the scheme are calculated as a percentage of a project's total cost (including the cost of equipment imported from other states and overseas) rather than on construction hours worked. Payments into the scheme therefore have no bearing on payments out with the result that the Scheme operates in an economically inefficient manner and has become significantly overfunded. At 30 June 2012, assets exceeded projected liabilities by \$25 million.



It can also result in a doubling up of payments by project developers. For example, the cost of constructing demountable buildings brought into the NT from another state are likely to have been subject to a levy in that state as well being subject to the NT Build levy.

As well as unnecessarily adding to project costs, two other features of the scheme are adding to investment uncertainty and risk. Firstly, the scope of activities subject to the scheme is vaguely defined and is being continually expanded by the Scheme's administrators. These have for example, recently sought to extend the definition of construction to line preparation for seismic. Secondly, changes introduced to the Scheme in 2009 make it unclear as to what a projects liability would be if its total cost exceeds \$1 billion. That is because the Minister can determine a different (but unspecified) percentage rate to apply to project costs over \$1 billion.

An internal review of the scheme is currently being undertaken by the Chairman of NT Build with assistance from NT Build staff members. However, as a minimum the scheme needs to be fully reviewed by an independent third party such as an accounting firm or economic consultancy with clearly defined terms of reference, timelines and processes for consultation and comment. This should lead to a major reform of the scheme including a shift to a wages-based model (as applies in five of Australia's seven other states and territories) and clearer boundaries on the scheme's coverage.

Recommendation

- The NT Government commission an external third party organisation to conduct a full and independent review of the NT Build scheme so as to ensure that it is operating in an efficient and transparent manner. Payments into the scheme should be based on wages paid to NT workers directly engaged in the construction of buildings and production facilities located in the NT.

EFFICIENT AND ROBUST REGULATION

Onshore regulation

Effective regulation is critical to building community confidence as it ensures that activities are assessed and approved to standards that mitigate risk and minimise environmental impacts. Regulation must also be efficient, in terms of avoiding duplication and being predictable and transparent, if investment is to be encouraged and maximised.

Continuous improvement and the maintenance of an objective-based regulatory framework will be important to address environmental impacts – a key requirement that government and industry must continue to meet in order for the benefits of shale and tight gas to be accessed.



The oil and gas industry is committed to working with the regulator in updating and adapting the onshore regulatory regime to changes in the industry including the development of a shale oil and gas sector. At the request of the NT Government, an independent and comprehensive review of approvals processes and regulation applying to onshore oil and gas was undertaken by Dr Tina Hunter (formerly Assistant Professor at Bond University) in 2011. Dr Hunter's recommendations and the government's response are on the Department of Mines and Energy (DME) website.

Many of the report's recommendations have been implemented or in the process of being implemented as resources permit. In particular, the Department recently indicated that it is giving priority to the following reforms:

- Completing of the recommendations of the Independent review of the Territory Petroleum Legislation and how it relates to the regulation of unconventional oil and gas;
- Converting the *Schedule (Guidelines) of Onshore Petroleum Exploration and Production Requirements 2012* into two parts and moving those parts into Petroleum Regulations – Environment Management Regulations & Resource Management Regulations;
- Amending the Petroleum Act to introduce a "Vacant Land Release" system (amendments are currently before Parliament);
- Introducing stricter expectations and compliance to work programs during the application - grant process;
- Introducing similar expectations and compliance for all requests for renewals, suspension, waivers and extensions etc.;
- Developing Environment Management Plans (Summary) – completed and on the website;
- Formalising Policy and Guidelines on Chemical Disclosure for fracking fluids;
- Formalising Policy and Guidelines on water use, waste water management, testing, logging, reporting, testing schedules, required construction of water bores to Australasian and NZ standards;
- Removing petroleum industry exemptions under the Water Act and Waste Management and Pollution Control Act (although DME will continue to enforce higher standards of water management than those prescribed in the Water Act);
- Referring all oil and gas activities to the Environment Protection Agency (EPA) with the prospect of DME becoming an "agent" of the EPA;
- Reviewing the Petroleum Act, Petroleum (Submerged Land) Act and Energy Pipelines Act and potentially merging them into one Act.

There is an opportunity to better promote this significant reform agenda to the public, which will ultimately strengthen the Territory's capability in relation to oil and gas regulation. Widespread knowledge of the substantial work that has been undertaken by government will be a critical component of building public confidence. The industry is providing input to the reform process to help ensure that the objectives of efficiency and effectiveness described above are met. The industry also welcomes the way in which the DME is learning from and, where appropriate, adopting the reforms introduced in other jurisdictions, particularly those with emerging shale gas sectors like South Australia and Western Australia. This enables the Department to leverage the



work of others (thereby reducing its own costs) while helping to improve regulatory consistency across the nation.

The industry strongly support this process and recommends that the Government increase the level of resources available to the Department to ensure that it can complete the reform process in a timely manner, as well as meet the increasing demands being made on its services by the rapidly expanding onshore industry. This sort of expenditure should be seen as an investment towards securing the greater royalty revenue, jobs and economic activity that will ultimately flow from increased petroleum production.

A second priority of governments should be to ensure that its reform process and the outcomes it is delivering are well understood by the community, particularly those with an interest in the land accessed by petroleum explorers and producers.

Recommendations

- The NT Government ensure the level of resources available to the Energy Directorate of the Department of Mines and Energy keeps pace with the needs of a rapidly growing oil and gas industry and enables it to complete its wide-ranging regulatory reform process in a timely and predictable manner.
- The NT Government improve information sharing and community consultation about its regulatory reform process and the changes being introduced and how these are delivering a regulatory regime that is efficient and effective.

Access to offshore resources

Ongoing levels of exploration and appraisal activity are needed to develop a pipeline of projects which can underpin the economic stability and prosperity of the Territory.

Recent changes to Federal legislation concerning activities in Commonwealth waters may have successive impacts on the ability to, and amount of, exploration that occurs in NT waters.

The business environment that is created by the Commonwealth Government in their management of Commonwealth waters has significant flow on effects for the exploration and development of offshore oil and gas in the NT.

This submission has noted the important prospectivity of the Bonaparte and Browse basins and the opportunities for development of these basins via the NT. It is through Commonwealth policies and legislation that these opportunities for the NT are realised. These legislative changes include consideration of the effects of marine protected areas, restrictions on seismic activity or market interference via cash bidding for exploration permits.

For instance, whilst the Government has already declared the boundaries of the Commonwealth Marine Protected Areas, consultation is ongoing as to the Management Plans which govern



activities in those reserves. Should management plans unduly restrict development (such as pipelines), this may have flow on effects to the NT.

APPEA believes it is important that the NT government continues to participate fully in Commonwealth legislative development processes to ensure that its interests are recognised and advanced.

Streamlining project approvals

Industry supports strong environmental standards, based on scientific assessment and high levels of regulatory certainty. Unnecessary and duplicative regulation, particularly environmental regulation, continues to be a cause of frustration for the development of oil and gas projects and a burden that imposes unnecessary costs on industry, the community and individuals

APPEA's 'cutting green tape' report²⁴ released in 2012 identified a number of case studies where duplication was evident, including the Inpex Ichthys development which has processing facilities onshore near Darwin.

APPEA urges the NT Government to continue to investigate ways to streamline environmental approvals processes at all levels and between jurisdictions. This move to reduce regulatory burden will allow a greater focus on improving performance and competitiveness of the NT's energy future.

BUILDING TRUST WITH COMMUNITIES

Shale and tight gas resources can be developed safely and effectively as an economically important additional energy source which could also reduce Australia's greenhouse gas emissions.²⁵ Issues that have been the subject of public debate - health, cumulative impacts, seismicity, fugitive emissions, social impacts, groundwater contamination and best practice regulation for onshore natural gas - have been considered extensively in the existing literature.²⁶

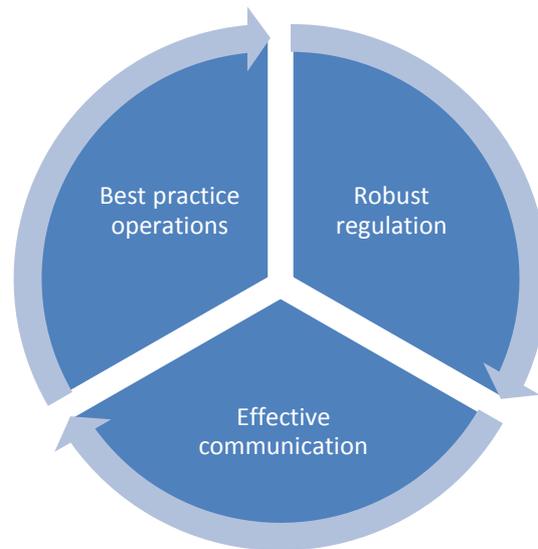
The industry has the technical capability to develop shale and tight gas resources. A key determinant of the rate of development will be community confidence.²⁷ Robust regulation, responsible operator practices and early and effective communication with stakeholders contribute to the development of public confidence.

²⁴ 'Cutting green tape: Streamlining major oil and gas project environmental approvals processes in Australia', APPEA, http://www.appea.com.au/wp-content/uploads/2013/04/APPEA_Cutting-Green-Tape.pdf.

²⁵ Cook, P, Beck, V, Brereton, D, Clark, R, Fisher, B, Kentish, S, Toomey, J and Williams, J (2013). 'Engineering Energy: Unconventional Gas Production.' Australian Council of Learned Academies (ACOLA), www.acola.org.au.

²⁶ These issues have been covered in detail in publications by ACOLA, the International Gas Union and International Energy Agency.

²⁷ 'Golden Rules for a Golden Age of Gas', International Energy Agency (2012), www.iea.org



The industry invests significant time and effort in working with independent experts and in engaging with communities and key stakeholders.²⁸ For example, APPEA, its NT members and the CSIRO have participated in a series of community information meetings in Darwin and regional centres organised by the DME.

The industry and governments have responsibility for informing and educating the community about their respective roles and activities. The industry is working to explain what it does, the risks this creates and how those risks are managed and minimised. Likewise, governments have an equally important role in informing the community about regulatory processes (such as permit application and activity monitoring processes), how these are changed and updated, and about decisions resulting from these processes (such as the recent reservation of the Darwin area).

APPEA and its members work closely with key stakeholders (affected landholders, Traditional Owners, shires, government representatives and other interest groups) to provide them with all relevant information in relation to activities. It is also working with its member companies on an industry-wide code of practice for the onshore gas industry.

Working with regional communities and the agriculture and pastoral sectors

APPEA is working nationally with peak farming and pastoral industry bodies and directly with regional communities to address some of the concerns about development of natural gas production on private land, including in relation to water management and farmers' and pastoralists' rights.

²⁸ ACOLA, P. 26.



The petroleum sector recognises that good communication and trust-building underpins successful coexistence. On this basis, APPEA is working with companies and the NT Cattleman's Association to establish a shared understanding of how science and cooperation can help in resolving technical issues and concerns about petroleum exploration activities.

The key concerns raised by NT pastoralists include:

- Long-term well integrity and risk to water aquifers;
- Biosecurity and chemicals management;
- Land access, compensation arrangements and pastoralists rights; and
- Uncertainty about the scale, nature and timing of future industry activity.

APPEA is in talks with the NTCA to develop a model access agreement which could be used in whole or in part by pastoralists and oil and gas operators and which would:

- Foster good communications and build trust between pastoralists and oil and gas operators;
- Protect the viability and amenity of pastoral land;
- Protect the environment – particularly water supplies; and
- Provide benefits to pastoralists in the form of compensation for damage or disturbance, improvements to infrastructure such as station roads and water production facilities, and opportunities to earn additional income from contract work.

APPEA and the NTCA are aiming to finalise the model access agreement in early 2014.

Working with Traditional Owners

Shale and tight gas exploration companies working with Traditional Owners in the NT have made it a priority to engage with Aboriginal communities. As the projects move from exploration to commercial development, Traditional Owners will emerge as key beneficiaries of the onshore petroleum industry.

APPEA aims to assist oil and gas operators and Aboriginal communities by working with the land councils in the development and provision of information about the industry's activities and environmental impacts. APPEA is also seeking to ensure that approvals processes for gaining access to land operate in a transparent and efficient manner to the benefit of all parties, including indigenous communities.

THE IMPORTANCE OF A FACT-BASED DISCUSSION

The strength of the industry's ongoing commitment to continuous improvement and the extensive regulatory oversight of the industry are often lost within the onshore gas debate. This



debate has often seen fact and science-based evidence diluted by extremist claims from “ideological crusaders”²⁹ seeking to spread misinformation rather than engage in a constructive dialogue. In this regard, Attachment 1 provides details of ‘Frequently Asked Questions’ and responses that APPEA has used to clarify a number of inaccurate statements.

However, it is noted that APPEA has also had positive engagement with conservation groups where there is an appetite to constructively discuss the issues and how activities can be better managed.

APPEA strongly believes that trust is critical to building community confidence and where there are legitimate landowner concerns they must be addressed by the industry.

Case Study: Informing the Discussion with Independent Third Parties

In June 2013 CSIRO participated in an initial workshop on onshore oil and gas with members of the NT Cattleman’s Association (NTCA). CSIRO’s Chief Research Scientist for water use in the resources sector (Professor Damian Barrett), plus 10 representatives from 7 onshore operators led a briefing and discussion session that addressed issues such as long-term well integrity, chemicals management and benefits for pastoralists.

In September 2013 APPEA, CSIRO and representatives of four companies operating in the southern half of the NT participated in community information meetings organised by the DME and held in Alice Springs and Tennant Creek. CSIRO also participated in community information meetings held in Darwin and Katherine on 21st and 22nd November which again, were strongly supported by the industry (8 companies represented at Darwin and 7 at Katherine).

The community information meetings aimed to provide information about shale oil and gas exploration in the NT and respond to community concerns around issues such as well integrity and impacts on water aquifers.

²⁹ Potter, B, “Demand to sort out ‘ideological crusaders’”, *Australian Financial Review*, 9 September 2013.



ATTACHMENT 1 – FREQUENTLY ASKED QUESTIONS

An Approach Based on Facts & Science, Not Fiction or Fear

Shale and tight gas is natural gas – the fuel the NT Power and Water Corporation uses to generate electricity for NT homes and businesses. It's clean and efficient, producing about half the greenhouse gas of coal in generating electricity.³⁰ The development of gas resources located near Alice Springs and off the Territory's west coast has been overwhelmingly positive for the economy. The further development of natural gas from shale and tight rocks in several onshore basins could be equally important in generating jobs, building infrastructure, providing income and increasing energy security. The industry supports high operational and regulatory standards based on science, transparency, stakeholder involvement, predictability and consistency.

What is Happening Around the World?

Worldwide shale gas production is expected to be the biggest single source of new global energy over the next two decades. The US EIA has estimated that shale gas production will increase from 34 per cent in 2011 to 50 per cent in 2040.³¹ The International Energy Agency estimates that natural gas will account for 20 per cent of world total primary energy supply by 2035.³²

The USA is leading the world in development of the shale gas industry with significant economic and environmental benefits. The recent and rapid transformation of the North American energy sector based on natural gas from its shale resources highlights the potential for these benefits. One recent study illustrates the extent of the transformation. It found that the resurgence in onshore gas and oil in the US had created 1.7 million jobs in 2012.

The UK Government is encouraging petroleum companies to step up drilling programs for shale gas in Britain. Britain has significant potential for shale gas, with a number of groups looking at how these resources can replace ageing, coal-fired power stations.

China and Canada are expected to become major shale gas producers as global energy consumption increases by more than 50 per cent in the next two decades.³³

What is Happening in the NT?

There is no shale or tight gas production in the NT at present though initial exploration by a number of companies is gaining momentum. Most of the Territory's existing supplies of natural gas come from the Blacktip project located near Wadeye. However, the Territory has extensive exploration areas showing potential for shale and tight gas production.

The most prospective areas for shale oil and gas are the Bonaparte, Beetaloo, McArthur, Georgina and Amadeus Basins. Most of the exploration projects are in the early or proof-of-concept stages. Exploration is governed by a tested framework of regulation and operating practices which focus

³⁰ US Environmental Protection Agency, 'Natural Gas', <http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html>.

³¹ US Energy Information Administration. 'Annual Energy Outlook 2013', http://www.eia.gov/forecasts/aeo/MT_naturalgas.cfm

³² IEA, <http://www.iea.org/publications/freepublications/publication/kwes.pdf>

³³ US Energy Information Administration, 'International Energy Outlook 2011', <http://www.eia.gov/forecasts/ieo/>



on reducing risks to the environment, ensuring safe operations and supporting open and transparent engagement with local residents.

If commercial development goes ahead, the gas would be used initially for domestic markets, delivering secure long-term supplies of gas at competitive prices for homes and industry. The industry has the potential to underpin a new phase of the NT's strong economic performance and promote economic and social development in regional areas.

What are the Facts About the Environmental Concerns?

The process of hydraulic fracturing

The process of hydraulic fracturing – pumping fluid into deep geological zones to stimulate the flow of gas into production wells – is one feature of tight and shale gas production. It has been used in the oil and gas industry in the NT for at least 30 years and in other states well before then. Since the 1950s, some 780 petroleum wells have been drilled and fractured in Western Australia with no adverse effects on the environment, water sources or public health according to the WA Department of Mines & Petroleum. It is a tightly controlled and highly regulated process.

The regulations covering the industry are stringent and comprehensive. An explanation of the process can be found on the websites of the DME and APPEA.³⁴

Protection of groundwater

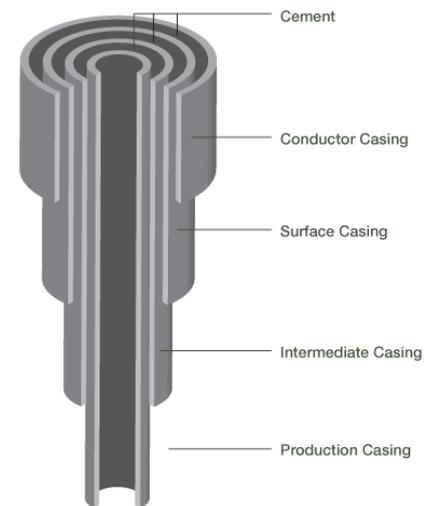
The industry recognises the conservation and protection of ground water is a top priority. Key factors which protect groundwater during natural gas production are:

- The strength of the wells

Reinforced steel and concrete casings are designed to keep the gas inside the well. The diagram to the right is a cross section of a typical shale or tight gas well, reinforced to keep gas in and water out.

An August 2011 report from the US Ground Water Protection Council examined more than 34,000 wells drilled and completed in the state of Ohio between 1983 and 2007, of which a total of 0.03 per cent had failures of casing or cement. Most of those incidents (more than 80 percent) occurred in the 1980s and 1990s before modern technology and

Typical Well Casing Diagram
(Not to Scale)



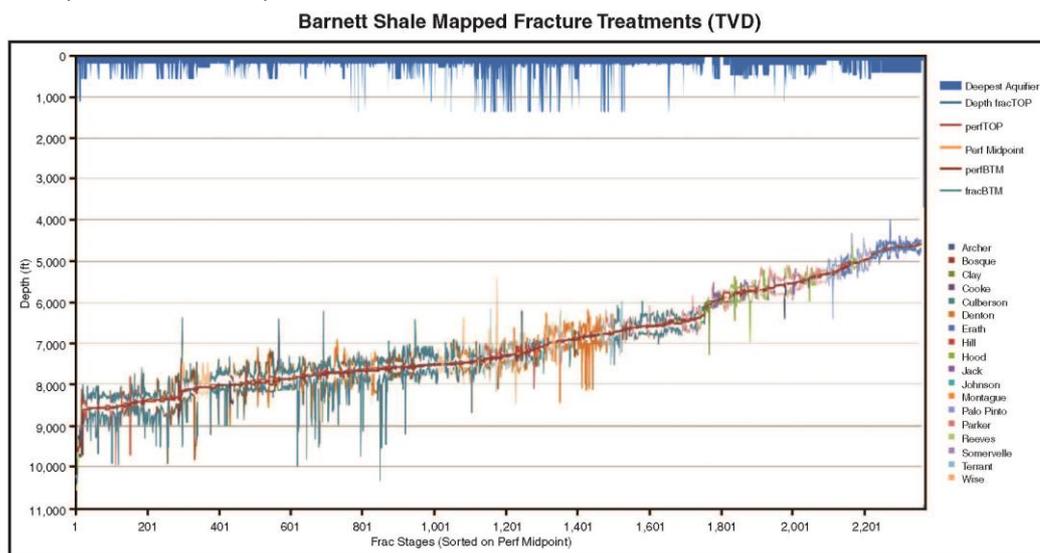
³⁴ DME: <http://www.minerals.nt.gov.au> ; APPEA: <http://wa-onshoregas.info>
More detail is available at http://www.youtube.com/watch?feature=player_embedded&v=BEH4M7EulsU



regulations. A similar study of 187,000 wells in Texas found that 21 incidents (0.01 per cent) related to well integrity.

- The depth of the gas-bearing rock

Shale and tight gas resources are typically between two and four kilometres below the ground, separated from near-surface freshwater aquifers by a least a kilometre of impermeable rock. The process of hydraulic fracturing is monitored to confirm that the extent of the rock fractures remain separated from ground water, typically by one to two kilometres of rock in the NT. Extensive research on hundreds of wells in the US has conclusively demonstrated that the fractures induced by the process are confined to the rocks close to the zone of interest. The following chart shows the depth of the process, the maximum extent of the induced fractures and the separation from aquifers.



- Effective monitoring programs

Highly trained technicians use a range of monitoring techniques based on seismic, pressure-testing and water sampling technology to show that the production process is working safely and effectively. Information from the monitoring is available to the public. These monitoring programs are closely regulated by various Government agencies.

- Limited water usage

Based on the NT experience to date, each stage of hydraulic fracturing uses about 2.5 million litres of water – equivalent to the contents of an Olympic swimming pool. A well may undergo several stages of fracturing but water use is reduced by the re-use of water that flows back to the surface following previous fracturing stages.



- Surface water management

Again based on the NT experience to date, up to 80 per cent of the fluids used during the fracturing process flow back to the surface. These fluids are stored in lined pits or in steel tanks until they can be reused in future fracturing jobs. When they are no longer needed, the fluids are placed in specially designed ponds for evaporation, leaving a small residue. This residue is tested and can then be safely removed and taken to a licensed disposal facility.

- Use of chemicals

The hydraulic fracturing fluid used to improve gas and oil production is typically comprised of more than 99.5 per cent water and sand and 0.5 per cent chemical additives. Many of the chemicals used are also found in common household and commercial applications. They include guar gum used in jelly sweets, salt, detergents and antiseptics - all of which are used in extremely low concentrations.

The chemical additives are assessed, fully disclosed and managed according to strict regulations. Monitoring ensures they remain in a closed process system – and don't contact fresh water.

Landscape Impacts

Opponents of natural gas production from shale and tight rocks have made wildly exaggerated claims about the number of wells which could be drilled in the NT. They have also used photographs of gas fields in the US which are very different in design and scale to the projects which might be developed in the NT.

A NT shale and tight gas development is expected to be based on multiple horizontal wells from one well pad. This allows for higher natural gas production from one location and a smaller land use footprint.

After a well is established and a project moves from exploration to production, most of the land is rehabilitated, leaving a small area around the well head and the associated infrastructure. Each well head will have a two metre tall "Christmas Tree" – or valve assembly – to control the gas production. These well pads would be spaced between one and three kilometres apart across a production area.

The number of wells and well pads will depend on the success of current exploration programs – and the development of gas markets, but will be far less than the unfounded claims being made.

The Gasland Myth

Gasland, a movie which has been used by groups opposing onshore natural gas development, was produced in the style of a documentary by filmmaker Josh Fox, who now makes a successful living from anti-gas campaigning.



A number of US authorities have followed up the allegations in his film and have found the majority to be untrue. For example, the signature scene is a “flammable faucet” segment in which a Colorado householder claims that gas producers have polluted his water supply with methane. He demonstrates this by lighting a match next to a kitchen tap which bursts into flames.

Tests by the State of Colorado Oil and Gas Conservation Commission on this location showed the gas was naturally occurring and not the result of commercial gas production activity.³⁵ The household bore had intersected a natural biogenic methane accumulation – a common local phenomenon reported long before the gas producers arrived on the scene. Mr Fox was provided with this information but chose not to use it in the film.

A more complete analysis of the film can be found at Energy in Depth.³⁶

Calls for a Moratorium

Some opponents of the industry have called for a moratorium on shale and tight gas exploration.

A halt to exploration would be counter-productive and unnecessary given the regulatory assessment and requirements imposed on operators by the Department of Mines & Energy and the Environmental Protection Agency. The information from exploration programs is being used to provide important data for the effective management and regulation of a future industry.

The moratorium would stop this flow of information and delay the introduction of shale and tight gas - without improving the level of local knowledge. This knowledge will be important in developing operational and regulatory approaches which can ensure that the Territory's shale and tight gas resources are developed in an environmentally responsible manner.

Exploration for shale oil and gas is also providing valuable new data about the size and location of the NT's underground water resources. New aquifers have been discovered including deeper saline aquifers unsuitable as drinking water but able to be used for drilling and hydraulic fracturing.

A Partnership Approach

APPEA has worked with the Territory Government and CSIRO to conduct public meetings and workshops in regional communities that provide access to information people can trust and to create a dialogue with regulators and exploration companies. The NT industry believes that this partnership represents a proactive, innovative and responsible approach for delivering local background information to support national and international scientific studies.

³⁵ State of Colorado Oil & Gas Conservation Commission, <http://cogcc.state.co.us/library/GASLAND%20DOC.pdf>

³⁶ Energy in Depth, 'GasLand Debunked', <http://www.energyindepth.org/wp-content/uploads/2011/11/Debunking-Gasland.pdf>