

State of the industry 2011



The upstream oil and gas industry contributes significantly to Australia's energy security, jobs and wealth for this paper and the industry's role on the upstream production. The importance of oil and gas resources cannot be overstated as petroleum accounts for 41% of Australia's primary energy. Coal 41% and renewable energy sources will continue to share and in the long term thermal energy, hydro and nuclear energy may also play a role. However, for at least the next 20 years oil, gas and coal will continue to be Australia's energy sources. The oil and gas industry has made a significant contribution to the

A status report on *Platform for Prosperity*— a strategy for maximising the value of Australia's oil and gas resources



Preface

State of the industry 2011 is the fourth annual implementation report for the Australian Upstream Oil and Gas Industry Strategy. It provides an overview of Australia's oil and gas industry, highlighting recent developments, changes in the operating environment and key trends. This report also reviews factors limiting the industry's performance and actions being taken to address the impediments to growth identified in the strategy, *Platform for Prosperity*, published in 2007.

Platform for Prosperity was prepared by APPEA with the assistance of the Australian and state and territory governments, Geoscience Australia, CSIRO and other major stakeholders. It identified the opportunities and challenges facing the Australian oil and gas industry, the issues that could prevent these opportunities from being fully realised and the changes that could be adopted by governments, the industry and other stakeholders to address those issues. The report outlined a vision for the future of the industry and targets for the industry to aspire to over the ten years to 2017.

The Upstream Oil and Gas Industry Strategy continues to evolve to reflect changes in the industry and the environment in which it operates. Previous State of the industry reports adopted a number of changes to the strategy's high value-adding priorities and options and several more amendments have been introduced in this report.

The most significant change is the deletion of the target for industrial gas usage. Mining, mineral processing and other forms of manufacturing are major gas users. New developments, particularly new mining projects, are increasing gas demand and supporting the development of new gas production. However, many factors apart from gas supply determine whether these types of projects proceed and these factors are largely beyond the ability of the upstream gas industry to influence.

The high value-adding priority concerning fiscal terms has been expanded to encompass oil as well as gas projects and a new option has been added to cover fiscal terms other than company tax.

A comprehensive review of the strategy is to be undertaken during 2012, five years since its commencement and halfway through its ten-year time horizon.

This report reviews the updated high value-adding priorities and options and reports on progress towards their implementation. It also provides an updated advocacy blueprint for the upstream oil and gas industry.

Further information about the Upstream Oil and Gas Industry Strategy and copies of this and previous reports are available on the APPEA website: www.appea.com.au

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Upstream oil and gas industry strategy

Objectives

To ensure the value of Australia's oil and gas resources to the Australian people is maximised, petroleum energy security delivered and long-term sustainability of an Australian oil and gas industry assured.

Vision

In 2017 the upstream oil and gas industry is recognised as a vibrant, innovative, safe and responsible industry, producing reliable, clean energy and substantial wealth for Australia.

Targets

In the decade to 2017:

- oil, condensate and naturally occurring LPG production as a proportion of liquid fuels consumption is, on average, maintained at the 2006 level of 55 per cent or better.
- LNG production capacity increases from 20 million tonnes a year in 2008 to at least 50 million tonnes a year
- in a competitive electricity market, 70 per cent of all new electricity generation capacity installed in Australia is gas-fired.

Benefits to Australia

- A potential quantum improvement in the balance of trade—an extra \$20 billion a year by 2017.
- Lower greenhouse gas emissions—up to 220 million tonnes per annum of carbon dioxide equivalent avoided globally by 2017 (equivalent to around one third of Australia's projected greenhouse gas emissions in 2017).
- Greater energy supply security.
- Increased revenue to governments—billions of dollars a year. A single new LNG project for example, could pay \$40 billion (nominal dollars) in tax and royalties over a typical project life.
- A more skilled workforce and increased employment in the oil and gas sector and service industries (up to 52,000 new jobs at the peak).
- Increased regional development, particularly in WA, Queensland and the NT.
- Reduced water usage in electricity generation—air-cooled technology allows gas-fired power generation to use less than three per cent of the water used by a typical water-cooled coal-fired power station.

Table 1 Key industry statistics: 2010–11

		Value	Change on previous year
Value of Production (2009–10)		\$25.6 billion	-9.6 per cent
Taxes and Royalties (2009–10)		\$7.1 billion	-19.4 per cent
Petroleum Trade	Exports	\$25.3 billion	+24.6 per cent
	Imports	\$33.6 billion	+21.8 per cent
	Balance of trade	-\$8.3 billion deficit	-\$1.0 billion
Production	Oil, condensate & LPG	182mboe	+3.6 per cent
	LNG	20.1mt	+12.5 per cent
	Conventional gas	791bcf	-0.7 per cent
	Coal seam gas	222bcf	+20.6 per cent
Exploration	Wells spudded onshore/offshore	24/38	0/-22 per cent
	Metres drilled onshore/offshore	45,400/94,100	0/-34 per cent
	Expenditure onshore/ offshore	\$0.7/ 2.6 billion	+1.1/ -6.8 per cent

Sources: APPEA 2011, BREE 2011, ABS 2011

NOTES 1 Figures are for the financial year 2010–11 unless otherwise indicated.
2 Exploration wells drilled and metres drilled exclude CSG. Expenditure includes CSG.

1 Summary

Australia's upstream oil and gas industry is in transformation, changing in nature and expanding rapidly to meet growing local and overseas demand for clean energy. This together with the changing social, economic and political environment is creating several significant challenges.

Australia's upstream petroleum industry is entering a new era. Driven by the world's growing demand for clean energy, an unprecedented wave of development is underway to convert gas resources across the country into jobs, wealth and clean energy. Around \$145 billion worth of new gas projects to supply Australian and exports markets are currently under construction with more being planned. Construction workforces of many thousands of skilled workers are being mobilised on construction sites and in workshops around the country.

The first of the multi-billion dollar LNG projects now under construction will commence production in 2012 (Pluto). Over a three year period from 2014, another six projects (Gorgon, Prelude and Wheatstone in Western Australia and three coal seam gas-based LNG projects in Queensland) are expected to start production. These will generate large, long-term economic benefits for the nation, including substantial export revenues, skilled employment and valuable streams of tax and royalty payments. Several other new LNG projects and expansions are also moving towards development decisions.

Australian gas will make a significant contribution towards reducing the growth in global greenhouse gas emissions.

For every tonne of greenhouse gasses emitted in Australia during the production of LNG, up to 9.5 tonnes of emissions can be avoided globally when compared with emissions from coal-fired electricity generation. Achievement of the Oil and Gas Industry Strategy's LNG and domestic gas targets will avoid global emissions of up to 220 million tonnes of CO₂-e a year by 2017, equivalent to around one third of Australia's projected greenhouse gas emissions in 2017.

Gas supply security and market efficiency are also being strengthened. By 2015, Western Australia will have five major gas supply hubs compared to the current two, with gas supply capacity increasing by more than 50 per cent. In the eastern states gas market, supply diversity and competition will increase as new coal seam gas-fuelled LNG (CSG-LNG) projects underwrite the development of new fields and infrastructure. Australia's network of gas pipelines is expanding and gas trading hubs have been established in Sydney, Adelaide and Brisbane.

Australia is also at the early stages of assessing and developing other forms of unconventional gas such as shale gas and tight gas. In the United States, advances in technology have led to a rapid expansion of this segment of the gas resource base and an increasing number of investors, including major North American companies, are hoping to achieve the same in Australia.

All of this growth and activity is positive for the industry and for the country. However, it is also creating some very significant problems. If not proactively addressed by governments and the industry, these challenges could seriously reduce the benefits flowing from the current wave of expansion and jeopardise future growth opportunities.

'Social licence to operate' under threat

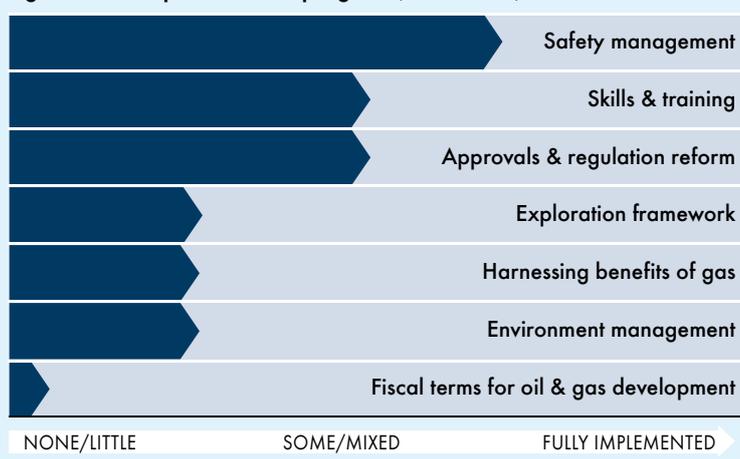
Community support for the industry and its 'social licence to operate' is being threatened on several fronts. Contributing factors include:

- the high-profile oil spill incidents in Australia and the Gulf of Mexico in 2009 and 2010 undermining community confidence in the industry's ability to safely operate in environmentally sensitive areas
- increasing community sensitivity towards the social and environmental effects of human and industry activity

Little additional progress on strategy priorities

As the strategy approaches the mid point of its ten-year horizon, it is clear that much remains to be done. Indeed, the extent of progress portrayed in Figure 1 is unchanged from the same diagram in *State of the industry 2010*. Further work is needed to progress the reform options for all of the high-value adding priorities.

Figure 1 Implementation progress (since 2007)



- expansion of the industry into more populated regional areas unfamiliar with industry practices and performance
- community concern about potential environmental impacts from fracture stimulation of wells.

As a result, the industry's activities are coming under increased scrutiny and regulation and its ability to access petroleum resources and development sites is becoming increasingly constrained. Misunderstanding and misrepresentation of CSG operations' environmental impacts, for example, are fuelling calls from some sections of the community for CSG production to be restricted or even terminated. Increased regulation and the trend towards imposing onerous conditions on approvals (for seismic activity and the arbitrary imposition of environmental offsets for example) are adding to costs and uncertainty without necessarily generating an environmental benefit.

Inadequate exploration

The long-term health of Australia's oil and gas industry is also being threatened by continuing low levels of exploration. Oil and gas cannot be produced without first locating new fields and new fields cannot be discovered without drilling wells. However, the number of exploration wells drilled in 2010, for conventional oil and gas, was the lowest in at least 27 years. The trend in Australia's production of liquid petroleum (crude oil, condensate and LPG) is steadily downwards resulting in a growing gap between Australia's liquids production and its consumption of petroleum products. Our net oil liquids import bill is growing, which has implications for Australia's longer-term energy security.

Over the five years from 2006 to 2010, less than 300 million barrels of liquids were discovered whereas Australia's consumption of refined petroleum products totalled more than 1500 million barrels. On current indications the strategy's liquids production target will not be met. The cumulative difference between actual and targeted liquids production is likely to be worth around \$20 billion from 2007 to 2017. Unless there is a major shift in exploration activity resulting in a sequence of new discoveries, the annual loss of income to the nation will keep increasing.

Wells cannot be drilled without access to good geoscientific data. A review of Geoscience Australia confirmed that there are strong 'public good' grounds for public investment in geoscience research and that such investment delivers high economic returns. As noted by the Minister for Resources and Energy in April 2011, the government's investment of \$75 million for work under Geoscience Australia's *Offshore Energy Security Program* has delivered a return on investment of 833 per cent for committed exploration expenditure, rising to

over 2000 per cent if secondary programs are added. The government has acknowledged these returns and recognised the need to attract exploration to the 80 per cent of Australia's petroleum basins that remain largely unexplored, yet long-term funding arrangements for geoscience research remain uncertain.

Frontier exploration is expensive and has a higher risk of failure. Australia is also disadvantaged by a lack of infrastructure in frontier areas and perceptions among international investors that while having good gas prospectivity, the country has relatively low oil prospectivity. Given these factors, Australia's tax terms for frontier exploration are internationally uncompetitive. The industry's representations to the National Review of Taxation and other policy review processes have, so far gone unheeded. The well count in frontier areas—the regions holding the greatest potential of containing a major new petroleum province—remains low.

Increasing costs and declining productivity are a threat

Skills shortages, rising material costs and declining labour productivity also pose major challenges to the projects now under development and being planned. Surveys of employers in the resources and constructions sectors by the RMIT University have identified a large deterioration in labour productivity in those sectors over the past two years. This has been due to several factors, including an inability to negotiate productivity improvements in exchange for wage increases, a decline in the ability of employers to engage directly with their workforce, low levels of workplace flexibility and difficulties encountered in the enterprise bargaining process. Large wage increases in the offshore construction sector threaten to flow through to other sectors of the economy. Project developers are under pressure to increase the use of Australian industry but rising wages and costs of sourcing labour (including through migration programs) will work against this by reducing local industry competitiveness. Changes to Australia's workplace laws, further investment in skills development and training as well as flexible and efficient skilled migration programs are needed to address these problems.

Policy reforms must be well targeted

Climate change and taxation reform have dominated the public policy debate for at least the past two years. Some positive outcomes have been achieved. However, many of the proposed policy changes have failed to grasp the opportunities presented by the extent of Australia's petroleum resources and the way they could be better used to support wealth and job creation and deliver significant local and global environmental benefits.

Much of the discussion about resources taxation has been about how to redistribute tax and royalty receipts rather than on reforms aimed at growing the tax base by improving industry competitiveness. Extension of the Petroleum Resource Rent Tax (PRRT) to onshore areas could significantly increase tax administration costs for projects and the government for marginal revenue gains. Investors in the industry would prefer a focus on improving the clarity and efficiency of the tax and addressing aspects of the company tax depreciation arrangements that disadvantage investment in high-cost, long-life gas projects. This would deliver much larger long-term returns to the nation.

Likewise, climate change policies should seek to exploit the opportunity to use Australia's large gas resources to reduce the growth in greenhouse gas emissions in Australia and other countries. The introduction of a carbon pricing mechanism will enable carbon intensity to be built into energy pricing and investment decisions in Australia. However, in a climate policy framework based on reducing emissions at least cost, there is no place for the many high-cost renewable energy schemes and subsidies now operated by state and federal governments. These should be reviewed and only those schemes that can address a clear market failure (not addressed by the carbon price) at least cost, without compromising the efficiency of the carbon pricing mechanism, should be retained. Care should also be taken to ensure that Australia's approach to carbon pricing does not have the perverse effect of increasing global emissions growth. Imposing a carbon cost on Australian LNG projects that is not borne by overseas competitors would reduce the competitiveness of Australia's LNG industry and its ability to secure the sales contracts needed to underwrite new investment.

Inefficient and costly approvals and regulatory processes persist

Despite institutional reforms in state and federal regulatory agencies, regulation and approvals processes are becoming increasingly inefficient and costly. Increasing restrictions on access to resources, inefficient and duplicative processes, the growing imposition of environmental offsets on environmental approvals without any form of cost/benefit analysis, and the trend towards imposing cost recovery charges with little control over service quality, are significantly adding to project costs and risks. This creates a 'value leakage' that reduces returns to investors and the community from resources development. This leakage reduces tax revenues to governments and projects' ability to provide funding to other areas such as regional infrastructure, community services and assistance to local suppliers. The industry can, to a point, absorb these costs while markets are buoyant but projects will be deferred or lost when conditions are less favourable.

In the Fraser Institute's 2011 *Global Petroleum Survey*, petroleum industry managers from around the world viewed Australia's performance in regard to approvals processes and regulation as being a major deterrent to investment and often in the bottom half of world performance. The introduction of new regulatory arrangements provides the opportunity to restart the approvals review process and refocus attention on reforms that will reduce duplication and improve transparency and efficiency.

A coordinated reform effort is needed

In response to the Montara and Macondo incidents, the industry and governments have worked together to develop and implement changes to industry practices and regulation. These changes will greatly reduce the likelihood of such events occurring, and if such events do occur, the industry will be better prepared and the risk to personnel safety and the environment will be considerably lower.

A similar degree of cooperation between all governments, portfolios within governments and the industry is needed to make the most of the opportunities available to Australia's oil and gas industry and to address the challenges it faces. The potential rewards for the nation in terms of increased wealth creation, employment, energy security and environmental gains are substantial.

Policy and regulatory reform across a range of portfolios is required. The development of the national Energy White Paper provides the opportunity for this to occur in a coordinated fashion. However, it will be important to ensure that energy policy is not subordinate to, or constrained by, pre-ordained policy positions in key areas such as resources taxation and climate change. Achieving the nation's energy policy goals will require ongoing investment by industry, which in turn requires an internationally competitive investment policy package. Policies on taxation, climate change, skills development, regulation and the like must therefore be flexibly applied and where necessary modified to best serve broader policy objectives. This applies not only to the energy sector but also to other realms of business and community activity. A narrowly focused, portfolio by portfolio approach to reform will fail to deliver the consistent and competitive outcomes that Australia needs.

Report structure

Section 2 provides further detail about how the Australian oil and gas industry is changing and the challenges it is facing. Section 3 reviews progress against the strategy's three production targets. Section 4 reviews progress towards implementing options for addressing the strategy's high value-adding priorities.

2 A changing landscape

2.1 An industry in transformation

The Australian oil and gas industry is undergoing a period of transformation and growth at a time of major change in the social, economic and political environment in which it operates.

The global financial crisis that started in 2007 continues to cast a cloud over the world economy. High sovereign debt and low economic growth in the USA and Europe as well as uncertainty around economic growth in China, have made investors and consumers nervous. Markets for equity, foreign exchange and commodities have all become more volatile and prone to rapid fluctuations.

Oil prices for example, have tended to fluctuate within a wide range of US\$80 to US\$110 per barrel (Figure 2). On several occasions over recent years, prices have fallen or increased rapidly in response to world events or changes in sentiment.

Business activity and consumer confidence are also becoming increasingly globalised with events in one region quickly affecting activity or sentiment in other parts of the world. This is contributing to the transformation of Australia's oil and gas industry. Advances in drilling and gas processing technology for example, are being adopted in Australia to open up new sources of petroleum and develop previously uneconomic gas fields. Companies are cooperating internationally to develop and implement best practice safety and environmental management processes and responses to issues or incidents such as the Macondo and Montara oil spills.

Another driver of the Australian oil and gas industry's transformation is the ongoing strength of world energy demand and energy pricing. This has been underpinned by high rates of China's economic growth and China's

status as the world's largest energy consumer. Australia is well placed to increase its gas exports to China and other Asian countries seeking to not only meet their rapidly increasing demand for energy but also to develop a cleaner energy mix.

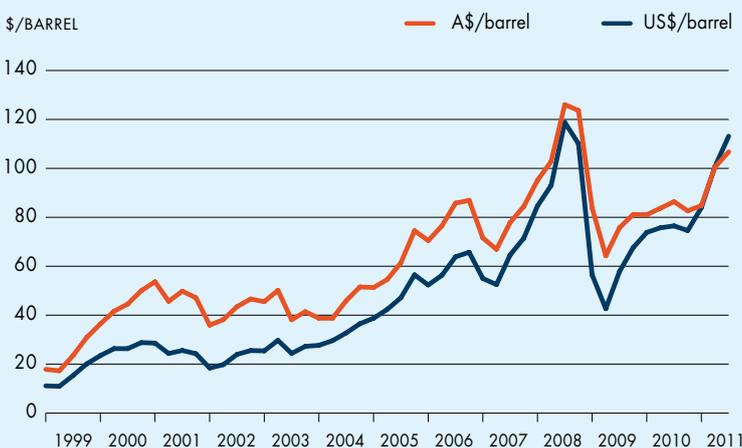
Following a 2 per cent decline in 2009, world gas consumption increased by 7.5 per cent in 2010 (IEA 2011). This rebound may be partially due to one-off factors such as the economic recovery in the US and Asia and unusually severe weather (hot and cold) in various parts of the world in that year. Even so, world gas consumption is expected to grow strongly over the medium to long term, driven by increasing energy demand in the developing world and a growing focus on clean energy. China's 12th Five-Year Plan for example, is aimed at more than doubling the share of gas in that country's primary energy mix from 3.8 per cent in 2008 to 8.3 per cent in 2015. The growth of nuclear power in Japan and elsewhere is being reassessed following the disaster at the Fukushima nuclear power plant in March 2011. Despite the absence of coordinated global action on greenhouse gas emissions, China and a growing number of other countries are seeking to reduce their growth in emissions of carbon and other pollutants by shifting their energy mix towards gas.

Growth in gas demand is being matched by equally strong growth in the global gas resource base. Unconventional gas resources are now estimated to be as large as conventional gas resources. Reflecting these positive demand and supply dynamics, BP and the International Energy Agency (IEA) have published projections suggesting world gas demand could increase at an average rate of around 2 per cent a year over the next 20 to 25 years. BP expects global gas production to increase at an average of 2.1 per cent a year from 2010 to 2030 (BP 2011) while the IEA forecasts gas demand to increase at an average of 1.8 per cent a year from 2008 to 2035 (IEA 2011). Growth is expected to be highest in the Middle East and non-OECD Asia including growth of just under 8 per cent a year in China (IEA: 7.7 per cent a year to 2035, BP: 7.6 per cent a year to 2030).

Australia's large gas resources, proximity to Asia and stable economic and political environment have enabled it to capture a share of this growth story by securing new gas markets and embarking upon an unprecedented program of investment in gas production and liquefaction infrastructure. This has triggered several major changes in Australia's upstream oil and gas industry:

- Exploration and development activity is now primarily focused on gas rather than oil (due also to a lack of oil exploration success over recent years).

Figure 2 World trade-weighted oil prices: 1999 to 2011



Source: BREE 2011

- The breadth of industry activity onshore and offshore has increased. Exploration has moved into areas with little if any previous exploration activity and has diversified to include unconventional forms of gas. Several major new gas production hubs supplying gas to domestic and/or export markets are being developed or are being considered for development.
- In less than ten years the CSG industry has captured a third of the eastern states gas market and within a few years it will be a major gas exporter.
- Investment in other forms of unconventional gas is gathering pace, made possible by new developments in technology and encouraged by the rapid growth of US shale and tight gas production.

As pointed out by the Minister for Resources and Energy in April 2011, the growth and changing nature of the industry are creating new challenges requiring the attention of governments and industry participants.

What we are witnessing in Australia is the emergence of new industries and new technologies – in a nutshell new opportunities for our petroleum industry.

These opportunities are to be welcomed and encouraged but at the same time we need to be mindful of the new challenges they bring with them.

The Hon. Martin Ferguson AM MP, Minister for Resources and Energy, Australian Government 2011a

2.1.1 Coal Seam Gas in Australia

Coal seam gas (CSG) is natural gas extracted from coal seams. The CSIRO has estimated that eastern Australia holds around 250 trillion cubic feet (tcf) of gas in coal seams, far greater than all of Australia's reserves of conventional gas and enough to power a city of five million people for 1000 years.

As indicated in Figure 3, Australia's CSG industry has grown rapidly with production increasing from around 10 petajoules (PJ) in 2004 to 222PJ in 2010. The industry grew by 24 per cent in 2010, to represent 32 per cent of all gas supplied to the eastern states gas market (comprising Queensland, NSW, Victoria, Tasmania and South Australia). Production is concentrated in

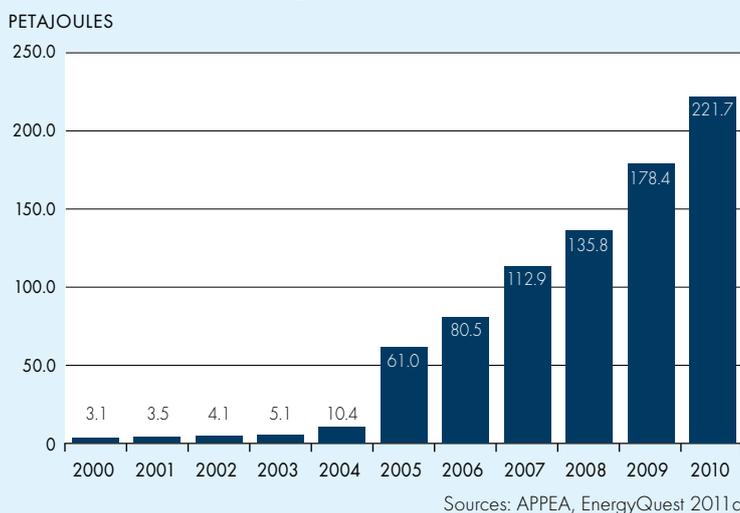
Queensland's Bowen and Surat basins (56.8PJ in the June quarter 2011) with small but increasing levels of production in NSW (0.1PJ in the Gunnedah Basin and 1.4PJ in the Sydney Basin). In the June quarter 2011 CSG production exceeded Queensland's gas consumption of 50PJ (*Energy Quest 2011b*). During 2009-10, 12 per cent of Queensland's electricity was generated from CSG and as at 30 June 2010, CSG was used to fuel 15 per cent of the state's electricity generation capacity (*ESAA 2011*).

The use of CSG for electricity generation and its share of the total eastern states gas market are likely to continue to increase as the creation of an LNG export industry underwrites the development of new CSG production and transportation infrastructure. The emergence of CSG for LNG production (CSG-LNG) will enable gas resources to be developed on a much bigger scale than would be possible from a reliance on only the Australian gas market.

The three CSG-LNG projects now under construction use gas sourced from the Bowen and Surat basins and piped to LNG plants near Gladstone (see Table 3 in section 3.2.1 for details).

Each of these projects requires drilling many wells over the project life, the laying of hundreds of kilometres of interconnecting pipelines and construction of a gas transmission pipeline from the inland basins to the LNG plants on the coast. The Australia Pacific LNG project for example will require a new 450 kilometre pipeline to Gladstone and up to 10,000 wells over a 30 year period (if the project is expanded to four trains).

Figure 3 Australian CSG production: 2000 to 2010



Fracture stimulation

Hydraulic fracture stimulation is the process of using hydraulic pressure to open up the natural cleats in coal and fractures in tight rock formations to allow gas to flow freely. This improves gas flow, reduces the number of wells drilled and has been safely used in the conventional oil and gas industry in Australia and overseas for many decades.

Hydraulic fracturing fluids are commonly 99 per cent sand and water. Around 1 per cent is made up of additives: typically widely used chemicals, including sodium hypochlorite, hydrochloric acid (both used in swimming pools), cellulose (used to make paper), acetic acid (the active part of vinegar) and small amounts of disinfectants. The chemicals used in hydraulic fracturing are not secret and are listed on the websites of APPEA and CSG companies.

Additives used in hydraulic fracturing fluids are regulated and must be registered with the Australian regulatory body, the National Industrial Chemicals Notification and Assessment Scheme. BTEX chemicals (benzene, toluene, ethylbenzene, xylene) are not used in the hydraulic fracturing of CSG wells.

While the CSG industry already supplies a third of eastern Australia's gas demand, the increasing scale of activity, expansion into new areas and the use of technologies unfamiliar to the general community (such as hydraulic fracturing) have raised community concerns. These relate mainly to the granting of access rights to CSG companies and CSG operations' effects on groundwater and land productivity. This has been most evident in areas that have had little previous exposure to the oil and gas industry and in parts of agricultural regions in inland NSW and Queensland.

State governments have taken a consultative approach and are working with landholders, communities and the CSG industry to improve policies and regulations governing land access, drilling and well construction procedures and water management. In Queensland these include the *Strategic Cropping Land Policy* and associated guidelines while the NSW Government is developing a *Strategic Land Use Policy*. Good progress is being made at this level with companies striving to better inform the community of the reality of CSG development and regulation as well as its social and economic benefits.

The economic, social and environmental effects of CSG development are being considered by two parliamentary inquiries. The Senate Rural Affairs and Transport Committee is expected to table its report on the management of the Murray-Darling Basin in late 2011 and an inquiry by the NSW Upper House is expected to report in April 2012.

CSG operators and the industry will continue to work closely with landholders, communities and governments of all levels, to provide accurate information about the industry's activities and its environmental impacts and will genuinely consider and respond to objections and concerns.

Monitoring activities undertaken by CSG producers have demonstrated no long-term water impacts outside the gas-producing coal seams, but further independent research is being undertaken. This will help to improve industry and community understanding of the impacts of the industry's activity and enable a science-based approach to be taken by regulators and governments. Studies, such as one into the effects of CSG production on water tables in the Namoi catchment in NSW, have been commissioned. The CSIRO, in partnership with Australia Pacific LNG, is also providing research in key areas.

A *We want CSG* campaign was launched in September 2011 to give voice to those in the community that support CSG development and the benefits it brings, to help increase community understanding of the industry and to highlight its long-term benefits. These include job creation, business development and the provision of new services and infrastructure (such as improved air transport, public housing and health facilities) in regional communities in NSW and Queensland.

The campaign also highlights the environmental benefits of using gas to meet growing energy needs, including reduced land disturbance and reduced CO₂ emissions compared with the mining and use of coal for power generation (see www.wewantcsg.com.au for more information).

CSG irrigation project to benefit farmers

Santos has formed a partnership with Mount Hope Station in Queensland to demonstrate how CSG could enhance farming production. Under the *Mount Hope Station Irrigation Pilot Project*, Santos will provide the station with treated CSG water and a state-of-the-art pivot irrigation system to irrigate high protein forage crops such as leucaena. At its *Fairview Irrigation Project*, Santos found that by feeding cattle on irrigated leucaena animal production could be increased from one beast per five hectares to up to five beasts per hectare.

Santos will provide Mount Hope Station with around 700 megalitres of treated CSG water over the initial four-year partnership and is looking to replicate this pilot project with other farmers in the region.

Santos has a comprehensive water strategy that focuses on developing long-term solutions that benefit local communities and the environment. This is complemented by a best-practice monitoring program.

Ongoing research

GISERA, or the Gas Industry Social and Environmental Research Alliance, is a jointly-funded partnership between CSIRO and Australian Pacific LNG (a CSG-LNG joint venture between Origin and ConocoPhillips) to provide research on the impact of CSG on five key areas: agriculture, water, biodiversity, marine, and communities.

CSIRO and Australia Pacific LNG as foundation members, have provided initial seed funding totalling \$14 million over the next five years for a new research alliance to undertake research into the sustainable development of Queensland's CSG industry. The initiative was launched on 14 July 2011.

Additional information about the CSG industry is being called for by stakeholders such as regional communities, farmers and conservation groups. GISERA will play a crucial role in ensuring science contributes constructively and objectively to this desire for additional information which will be used to further shape and guide the CSG-LNG industry.

It is envisaged that membership of GISERA will be expanded to other companies both in and outside of the industry, as well as research purchasers and providers such as government agencies and universities. Stakeholders such as agricultural industries and communities will also be sought as members.

While GISERA's initial focus will be directed at Queensland's CSG-LNG industry, it has the potential to expand its focus to gas operations in other parts of Australia. Results will be made publicly available following peer review, with all relevant material posted on the GISERA website (www.gisera.org.au).

Environmental benefits

Origin Energy's Darling Downs power station is a 630MW combined-cycle power station, the largest baseload power station of its kind in Australia. It is powered by natural gas piped from coal seam fields in southwest Queensland and can produce enough power to supply the equivalent of 400,000 Queensland homes each day. Darling Downs is one of Australia's most efficient baseload power stations and has less than half the greenhouse gas emissions of a typical coal-fired power station of the same capacity. Using air-cooled technology also allows Darling Downs to use less than 3 per cent of the water used by a typical water-cooled, coal-fired power station.

Origin 2011

Economic benefits

Modelling by the Queensland Government shows that investment of \$40 billion in a CSG-LNG industry with a capacity of 28mtpa (a mid-range estimate) would create more than 18,000 jobs, generate \$850 million in annual royalties and increase Queensland's Gross State Product by 1.0 per cent or \$3.1 billion (in 2005-06 dollars).

Most jobs and economic activity associated with the industry will be in regional areas. The towns of the Surat Basin, where most activity is centred, are now booming.

Today there are more than 8500 people working in the CSG industry.

A separate study of the economic significance of CSG in NSW found that a freeze on CSG development in that state would have the following results:

- wholesale gas prices across NSW, Victoria, South Australia and Tasmania will rise between 20 and 25 per cent in real terms by 2030
- electricity prices will rise in all regions of eastern Australia with NSW wholesale prices being on average 7.4 per cent higher over the period 2020 to 2030
- increased coal-fired power generation and less gas-fired generation leading to an increase in CO₂ emissions from the electricity generation sector of about 4mtpa by 2030
- NSW real incomes will be \$15.5 billion lower in total over the period to 2034-35 (\$5.1 billion lower in net present value terms which equates to approximately \$700 per NSW resident)
- reduced investment (of \$4.3 billion), recurrent operating expenditure (\$2.7 billion), employment (1,361 jobs on average) and NSW Government revenue (\$1.5 billion to 2034-35).

ACIL Tasman 2011

*The CSG industry has
the potential to create
thousands of jobs in
regional areas.*

2.2 Challenges to growth

2.2.1 Social licence to operate

The Upstream Oil and Gas Industry Strategy, *Platform for Prosperity*, recognised that maintaining community support and a social licence to operate is essential if the industry is to grow to its full potential.

Several factors can positively or negatively influence our industry's social licence to operate. The degree of community support can also vary from one part of the industry to another or from one activity to another. It can also change very rapidly in response to particular events such as a major oil spill or safety incident, even if those events occur in a distant part of the world.

Minister Ferguson noted that challenges to community support are inevitably underpinned by three common concerns:

- health and safety of workers
- responsible and sustainable environmental management
- community education and engagement.

He added that:

"All activities, whether they be onshore or offshore, need proper regulation, oversight, effective operating procedures and adherence to a culture of continuous improvement."

Australian Government 2011a

Industry and government must ensure that the community is confident of two things. Firstly, that members of the industry are genuinely committed to minimising the adverse impacts of their activities on people and on the environment. Secondly, that regulators protect the community's interests by providing independent and expert oversight, assessing and, where necessary, modifying the industry's activities.

Another key ingredient to maintaining a social licence to operate is the provision of adequate returns to the community. In a resources industry like ours, such returns must include an element of compensation for the depletion of the nation's oil and gas resources and for the loss of any environmental amenity. These community returns take a variety of forms and may vary markedly in size and cost. They can include:

- taxes, royalties and fees paid to state, territory and national governments
- provision of employment and training opportunities, particularly for the local population
- industry purchases of goods and services from Australian businesses and support for local service industries and suppliers to help them increase their competitiveness and capabilities
- contributions to social and economic infrastructure and services in local communities (such as the provision of facilities and services related to health, education, air and road transport, housing and recreation)

- investment in research and support for universities and other research institutions
- compensation to individual landowners or others whose rights or lifestyle have been affected by industry activities.

The Queensland CSG-LNG industry for example, is providing \$10.5 million for an Instrument Landing System to be installed at Gladstone airport to improve the ability of aircraft to land during adverse weather conditions. QGC, developer of the Queensland Curtis LNG project and Gladstone LNG Operations have developed integrated housing strategies that will accelerate land and housing development and improve the availability of community housing for low income earners and indigenous Australians. The North West Shelf Project injects \$800 million a year into Australian businesses through operating costs and contributes more than \$5 billion a year in Commonwealth and state taxes and royalties.

Impacts on the community can be negative as well as positive. Fly-in, fly-out operations, increased pressure on local services and rises in rent and housing costs can have adverse impacts on local communities that must be recognised and addressed. The image of the Australian upstream industry is sometimes tarnished by factors totally beyond its control such as rises in petrol and LPG prices. Similarly, expectations that gas can be supplied to domestic markets at "affordable" or subsidised prices are inconsistent with calls for increased investment, supply security and market competition. Even so, the industry is sometimes criticised for failing to deliver all of these.

The industry's expansion into new areas and its use of technologies not known or well understood outside the industry raise new community concerns that must be addressed if the social licence to operate is to be maintained. Growth in the CSG industry means more landholders are being affected by well drilling activities. They must be assured that CSG production will not affect water tables and their access to water. CSG operations and the beginning of the search for other forms of unconventional petroleum (particularly tight gas and shale gas) in various parts of the country have raised questions about the environmental impacts of fracture stimulation. In response the industry has sought to broadly consult with stakeholders, initiate research to fill information gaps and provide accurate and reliable information about their activities and its impacts.

Increased onshore activity, particularly in areas considered to have high environmental values, greater population and alternate land uses such as farming, is bound to raise new concerns. Industry activities are highly visible and can be easily misunderstood if adequate information about what is being done and its impact on the environment, is not widely disseminated at an early stage.

Expansion of exploration activity to new offshore frontier areas is less visible but can nonetheless raise passionate concerns about the perceived impacts on the marine environment. These include effects on fish stocks and

marine creatures such as whales and turtles, as well as more generalised impacts on areas regarded as being pristine or having particularly sensitive ecosystems. Recent examples of activities attracting media attention and criticism have included proposals to drill west of the Ningaloo reef, in the Great Australian Bight and offshore from southwest Western Australia and Sydney.

Elements of the community have also protested about the environmental impacts of onshore developments such as the construction of LNG projects on Barrow Island (a Class A reserve in the Pilbara) and at James Price Point in the Kimberley.

Major incidents with safety and environmental consequences or implications have incrementally undermined community confidence in the industry and in the level and competency of regulatory oversight by governments. An explosion at the Varanus Island gas plant in 2008 and resultant loss of around 40 per cent of Western Australia's domestic gas production capacity for several months caused significant gas shortages and economic disruptions in that state.

The uncontrolled release of hydrocarbons from the Montara field over 74 days and a fire on the drilling rig generated fears of injury to workers and major environmental damage. Subsequent inquiries identified shortcomings in the operator's drilling procedures and in the degree of oversight by regulators that are now in the process of being addressed. Even though the drilling rig was safely evacuated, the incident affected perceptions of the industry and its ability to safely operate in sensitive environments.

Community confidence in the industry took another battering when an explosion occurred on the Deepwater Horizon drilling rig operating in the Gulf of Mexico. Eleven workers were killed and the well leaked oil for 106 days before it was plugged. This caused significant damage to the Gulf Coast's environment and local economy.

Restoring community confidence in the industry and its social licence to operate will require a major effort. Governments and the industry must work together to improve regulation and regulatory systems, educate the community about new practices and technologies and engage local communities early about new projects. In addition, communities must be advised of the steps being taken to identify and respond to their concerns about potential impacts on the environment and land use.

2.2.2 Montara and Macondo oil spills

The Montara and Macondo oil spills have affected community perceptions of the industry and its social licence to operate. The industry must now rebuild confidence and improve oilfield practices and spill mitigation. Confidence in the regulatory system also needs to be restored by implementing changes

recommended by the inquiries into these incidents. Both inquiries recommended establishing a single, independent regulator, consistent with an earlier recommendation from the Productivity Commission's *Review of the Regulatory Burden on the Upstream Petroleum (Oil and Gas) Sector (PC 2009)*.

The Montara and Macondo incidents have strengthened the case for regulatory reform and added a sense of urgency to their implementation. The Australian Government has responded by establishing a National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) and a National Offshore Petroleum Titles Administrator (NOPTA). From January 2012, NOPSEMA will become the regulator for all offshore petroleum activities in Commonwealth waters beyond three nautical miles from the territorial sea baseline. NOPTA will administer titles and data relating to offshore petroleum, minerals and greenhouse gas storage activities in Commonwealth waters. The enabling legislation also allows for state and Northern Territory jurisdictions to confer powers for regulating offshore petroleum activities within their coastal waters (up to the three-mile nautical limit) to NOPSEMA and NOPTA.

When introducing the legislation in May 2011, the Minister noted that other recommendations by the Montara Commission of Inquiry and Productivity Commission concerning regulatory reform and oil spill management have been implemented or are in the process of being implemented. The Minister added that the full implementation of the government's final response to these reports will require sustained efforts over several years by governments, regulators and industry (*Australian Government 2011c*).

The oil and gas industry has also responded quickly to the Montara and Macondo incidents. Companies have thoroughly reviewed their operating practices, including those related to the design, operation and integrity of all wells, as well as their communication and verification protocols and emergency response preparedness. Several cross-industry initiatives have also been developed. These include a new industry-wide audit process for companies, contractors and regulators that will address many of the Montara Commission's recommendations on the design, construction, operation and testing of offshore wells. A new industry-wide mutual aid agreement has also been developed that will significantly reduce the time taken to deploy equipment and personnel to a significant incident. The Australian Marine Oil Spill Centre's operations and capacity have also been reviewed and improved.

Leadership on safety is however, not just a response to Montara on an 'offshore drilling' issue. The lessons learnt are being applied across the industry including onshore operations. The safety of all of the people working in the industry goes far beyond maintaining a social licence to operate. It must be a core value which underpins

everything the industry does and the way everything gets done. The industry's leaders are committed to achieving the highest standards of safety performance and are prepared to work together to achieve this outcome. Since 2007, a CEO Safety Leadership Forum has provided a renewed focus and strong leadership on safety across all aspects of the oil and gas industry. As a result several new programs and approaches have been introduced (see section 4.1 later in this report for details).

Implementing these and other measures for improving the industry's safety and environmental performance, in tandem with other regulatory reforms, will require continuing cooperation and commitment by the industry and the state, territory and Australian governments. Completing the work that has begun presents challenges for all parties but these must be addressed and reforms must be fully implemented if community confidence is to be restored and the industry's growth ambitions realised.

Industry response to the Montara and Macondo incidents

The Australian oil and gas industry has worked with government and international experts to ensure Australian well management practices reflect the lessons learnt from the Montara well blow-out in Australian waters and the Macondo well blow-out in the Gulf of Mexico. In Australia, the industry's response has been at three levels—individual companies, industry-wide through the APPEA Montara Taskforce and internationally, through the International Association of Oil and Gas Producer's (OGP) Global Industry Response Group (GIRG).

Companies operating in Australia have thoroughly reviewed their drilling procedures and critical safety, environmental management and operational areas, including well design, integrity and operations, barrier principles, verification systems and contingency plans and preparedness. Working through the Montara Taskforce, the industry has developed a program of collaborative activities aimed at improving Australia's well incident prevention, intervention and response capability.

This work has delivered:

- a new self audit tool to provide guidance in integrating permit holders' and contractors' well operations safety management systems
- a memorandum of understanding on mutual aid to encourage companies to assist each other and share equipment when responding to offshore incidents
- a commitment to designing and constructing a well-capping solution for Australian conditions
- increasing collaboration within the Australian offshore drilling industry, including the establishment of a new APPEA Well Integrity and Safety Committee
- an expansion of the industry's spill response capability including that provided by the industry-funded Australian Marine Oil Spill Centre (AMOSC).

This work will continue to be pursued through the APPEA Well Integrity and Safety Committee. This will allow the Australian industry to work closely with OGP's newly established Well Expert Committee to implement relevant international recommendations adapted to Australian circumstances.

Through AMOSC, the industry has further improved response effectiveness and timeliness. It has already:

- reviewed oil spill response equipment requirements and pre-positioned equipment to critical, active or sensitive locations around Australia
- doubled the AMOSC core group of trained oil spill responders from 42 to 84 people directly employed in the oil and gas industry, accredited to be the industry's oil response team and available to work with AMOSC in the event of an incident
- developed a new accredited oil spill management and spill-response training program
- facilitated better access to international expertise and provided ongoing representation at international fora
- improved fatigue-management programs.

Work is continuing on:

- investigating the potential benefits and limitations of dispersant use in spill response, including the use of airborne dispersant delivery systems, dispersant approval and dispersant supply chains
- investing in a major program of oil spill trajectory monitoring and modelling, providing real-time tracking of oil spills and more accurately predicting a spill's path, ensuring that response, protection and recovery strategies are directed effectively
- developing information-sharing systems.

AMOSC's activities are fully integrated into the *National Plan to Combat Pollution of the Sea by Oil and other Hazardous and Noxious Substances*, managed by the Australian Maritime Safety Authority. The National Plan, an integrated government and industry response framework, is currently being reviewed to examine the effectiveness of Australia's preparedness arrangements and response requirements.

The OGP's GIRG announced a series of recommendations for improving well incident prevention, intervention and response capability. These are being implemented by an OGP-governed Well Expert Committee, a well-capping consortium and an oil spill response joint industry project. APPEA directly or through its members, is participating in each of these.

Collectively, these measures will significantly reduce the risk of future oil and gas spills occurring and will enable a rapid and effective response to any such incidents.

2.2.3 Skills availability and productivity

The availability and productivity of skilled labour is another major challenge for the industry as investment and construction activity across the resources sector rises to unprecedented levels. Around \$145 billion is being invested in LNG projects currently under construction and other LNG projects at advanced stages of planning could cost as much again. The strong growth of the LNG sector and other parts of the resources industry has played a large part in boosting business investment to a record \$110 billion in 2010. However, Macquarie Equities has estimated that if all proposed LNG and mining projects stick to current schedules (admittedly an unlikely scenario), Australian business investment will increase by more than 50 per cent to \$170 billion in 2013. This would be around \$50 billion above Macquarie's estimate of the economy's maximum investment capacity.

The National Resources Sector Employment Taskforce estimated that the workforce requirement for new resources projects could increase from 30,000 workers in 2010 to a peak of up to 70,000 workers in 2013. The shortage of tradespersons will be particularly acute with an estimated 45,000 tradespersons needed to fill new jobs and replace those leaving the workforce. These figures may be conservative since Macquarie estimated that Australia's LNG projects alone could employ over 40,000 people during the peak construction period (Macquarie 2011b). Studies by state government agencies have also produced higher estimates of future skilled labour requirements across the resources sector. A skills strategy released by the West Australian Government in March 2011 stated that almost 240,000 new jobs are expected to be created in WA by 2017. With natural population growth and current migration levels, it is forecast that this will still leave a shortfall of about 150,000 skilled workers in WA in the next six years (WA Government 2011). Queensland must fill 140,000 jobs over the next two years, according to the Queensland Skills Commission.

In addition to construction labour requirements, Macquarie estimates 10,000 operational staff will be needed on

an ongoing basis to operate the new LNG projects now being built.

Labour shortages are resulting in high rates of wage inflation. In a recent survey, UK recruiting firm Hays found that Australian energy companies are paying engineers, geologists and other contractors 35 per cent more in 2011 than in 2010 and that Australian energy sector salaries are the third highest in the world.

Government and industry are working together to better understand the nature and extent of skills shortages and develop strategies for addressing them. New training programs and funding commitments have been announced. These must be quickly implemented and progressively expanded. However, these schemes will take time to deliver a significant increase in the skilled labour workforce and will not meet all of the projected requirements. Hence skilled labour must be sourced from other countries and this will require a more efficient and responsive skilled migration program. Industry has welcomed the decision to introduce *Enterprise Migration Agreements* for large resource projects and is working with the government to ensure that this initiative operates in an effective and efficient manner.

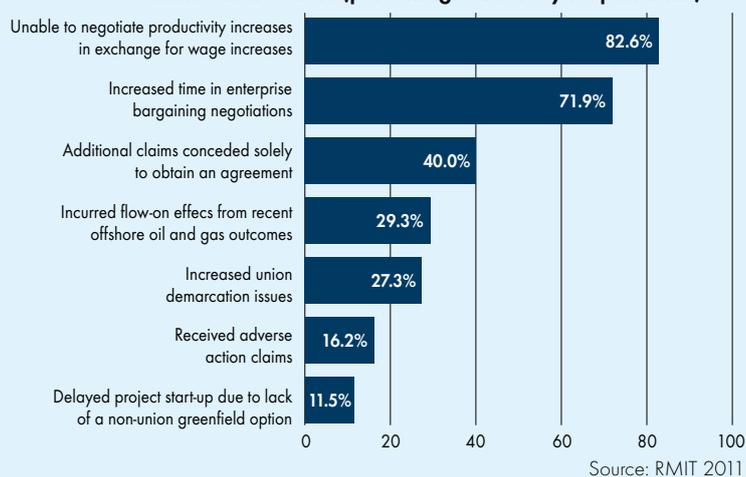
Increasing the size of the skilled labour workforce must be accompanied by reforms to increase its productivity. Australia's labour productivity, including that in the oil and gas sector, has been declining, resulting in higher project costs and delays to project completions.

Since April 2010, the RMIT University has undertaken bi-annual surveys of companies operating in the resources and construction sectors. These have found a large deterioration in labour productivity in those sectors over the past two years. The most recent survey in April 2011, collated responses from 74 companies employing more than 55,000 people. It highlighted several factors contributing to declining productivity, including an inability to negotiate productivity improvements in exchange for wage increases, a decline in the ability of employers to engage directly with their workforce, low levels of workplace flexibility and difficulties in enterprise bargaining (Figure 4).

It takes time to train new workers and develop skills to required levels. This training is occurring on a much larger scale than previously which will inevitably have an effect on productivity. However, as indicated by the RMIT survey, other factors reducing labour productivity must also be addressed.

Time lost due to industrial disputes is also increasing. Industrial relations reforms are needed to give Fair Work Australia or the Office of the Fair Work Ombudsman a stronger role in preventing disputes and to ensure that workplace collaboration focuses on genuine and good faith bargaining. Industrial relations reforms in the vocational education and training sector would help training institutions attract skilled staff and better meet industry requirements. Workplace laws must also provide greater flexibility to allow labour to move more easily between projects.

Figure 4 Factors affecting labour productivity in the resources and construction sectors (percentage of survey respondents)



A lot of projects being evaluated are moving to marginal economics because of recent cost increases. Any further increases in costs due to industrial factors or loss of productivity are likely to make some projects non-viable.

Michael Chaney, Chairman Woodside Energy and National Australia Bank, *The Australian*, 17 August 2011

So labour has become more expensive and on balance it has become less efficient. That is why the company (BHP Billiton) is on the record as saying an ongoing focus on productivity, which is the combination of the unit cost and the unit efficiency is a very important thing.

Marius Kloppers, Chief Executive BHP Billiton, *The Australian Financial Review*, 25 August 2011

2.2.4 Costs

After declining during 2009, the costs of building and operating upstream oil and gas facilities have resumed their upwards trend and are now approaching the record levels seen in the third quarter of 2008. Globally, development costs increased by 5 per cent on average during the six months to 31 March 2011 (Figure 5) and operating costs increased by 2 per cent. The biggest contributors to capital cost increases were steel (up 13 per cent), construction labour (9 per cent) and engineering and project management (6 per cent).

Well drilling costs have also increased significantly over the past decade (Figure 6). Hire rates for the drilling rigs most commonly used in Australian offshore waters (jack-ups and semi-submersible rigs) increased fourfold or more over the period from 2000 to 2009. In 2010, jack-up rates fell steeply but semi-submersible rates remain high. The market for shallow water semi-submersibles has softened but the market for deepwater rigs is still very tight. Day rates for onshore drilling rigs have also increased strongly over the past decade—average 2010 rates are generally 2.5 to 3 times higher than in 2000.

As indicated in Figure 7, most of the growth in industry revenue from higher oil and gas prices has been absorbed by increased costs, rather than higher profits.

Net profits peaked in 2007-08 at \$10.1 billion or 8.8 per cent of total assets. By 2009-10 net profits had declined by 30 per cent to just over \$7 billion. At the same time net assets grew strongly (by around \$35 billion) as a result of increased investment, so the ratio of profits to assets declined to 4.7 per cent—the lowest rate recorded for over 20 years.

It is also interesting to note that in 2009-10 payments of taxes and royalties exceeded industry net profits by about \$50 million. Most of the industry's revenue is spent on operating its assets, reinvesting in new facilities and in payments to governments. Not as some have suggested, on dividends to overseas shareholders.

One source of rapidly increasing costs is the charges and fees levied by governments and the costs imposed by government regulation and approvals processes. The industry has very little say over fee levels and the standard of service provided by regulators, but it is increasingly being expected to fully cover the governments' costs. These costs should be apportioned when there is a clear benefit to other parties or the wider community from the provision of government services. The most recent example has been the establishment of new regulatory agencies covering offshore activities. While the industry supports the reforms it is not the only beneficiary (improved regulation also provides a benefit to the general community) so it should not have to bear the full cost of the new agencies. This particularly applies when the industry has little control over budget setting and the efficient use of funds.

The industry is also being increasingly required to fund economic and social infrastructure and services that have a wider community benefit. The cost of these facilities and services should be apportioned between industry and governments according to usage. Serviced industrial sites with access to transport corridors and ports are commonly provided to major projects overseas. The hub approach to co-locating projects helps avoid duplication and promotes efficient development and use of infrastructure onsite and in nearby communities. However, it also has challenges including the need to secure larger areas of land in previously undeveloped areas and the need to address community concerns about possible adverse consequences such as environmental impacts and increased demand for local services.

Figure 5 Upstream costs indices: 2000 to 2011

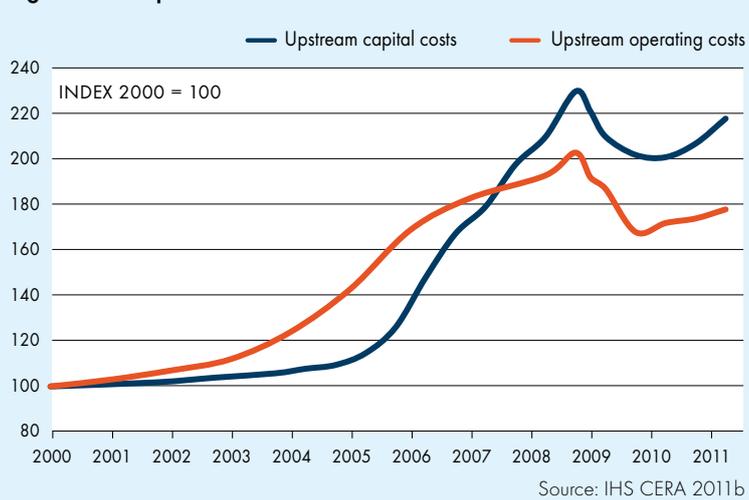
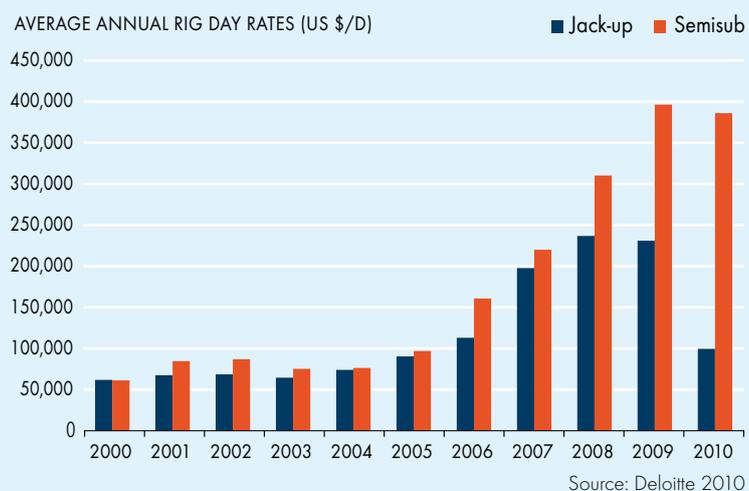


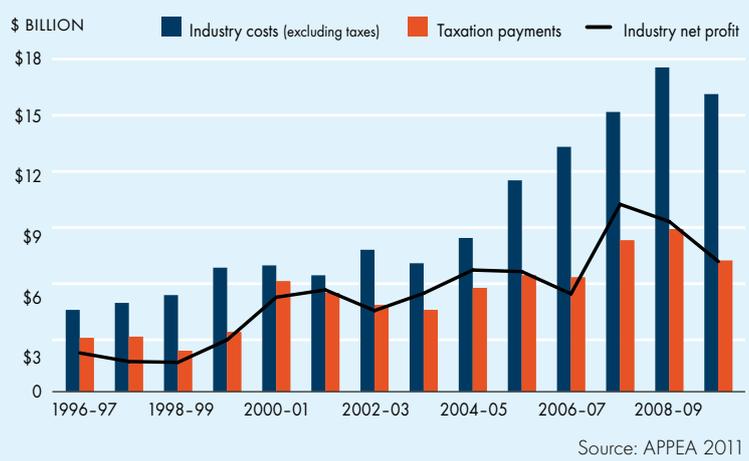
Figure 6 Rig rates for drilling in offshore Australia: 2000 to 2010



Cost increases are a major challenge for the industry and threat to its growth ambitions. International comparisons of global construction costs (such as those published by IHS CERA and reported in previous editions of *State of the industry*) consistently show proposed Australian LNG projects are among the highest cost in the world. In addition, Australia has struggled to deliver major resource projects on budget and on schedule. The final cost of Woodside Energy's Pluto project is expected to be \$14.9 billion, around \$2.9 billion or almost a quarter more than originally envisaged. The project is also running more than a year behind schedule. Macquarie Equities has estimated that final project costs of all Australian resources projects over \$2 billion sanctioned over the past ten years, have on average been 36 per cent higher than initial guidance (*Macquarie 2011a*).

Industry, governments and other stakeholders, including suppliers, must pursue every avenue for reducing costs, if Australia is to maximise the value of its petroleum resources and fully capture the current growth opportunity.

Figure 7 Upstream oil and gas industry financial performance: 1996-97 to 2009-10



2.2.5 Australian content

Over the past year the extent of Australian industry participation in new LNG projects has come under increased scrutiny. As new LNG projects have started construction, expectations have risen as to the volume of work likely to flow to local industry. Delays to contract awards or disappointment at not winning work considered to be within the capability of local companies, have prompted criticism of the industry and generated calls for government intervention. This challenge to the growth of Australia's petroleum industry must be recognised and appropriately managed by project proponents and governments.

The Australian petroleum industry is committed to providing full and fair opportunity to local suppliers. Through the *Australian Industry Participation National Framework*, project proponents develop and implement Australian industry participation plans and strategies for maximising Australian content. These include processes for identifying Australian industry capability and for working with suppliers to enhance their competitiveness and maximise their participation. Project proponents prefer to deal with local suppliers. They recognise that as operators of long-life projects, it is in their interests to have ready access to a diversified and internationally competitive services sector.

The current phase of industry growth provides the opportunity for suppliers of goods and services to the resources sector to grow their businesses. However, suppliers must ensure that they are internationally competitive and must understand and meet projects' requirements for cost, schedule and deliverability. Suppliers face the same cost pressures and skilled labour shortages as project proponents and are further disadvantaged by the high Australian dollar. This makes it even more important that suppliers focus on those areas of greatest value adding and cost competitiveness and look towards developing long-term business opportunities. Alliances with overseas companies and an export focus are important as they can provide access to new technology and help local suppliers break into global supply chains. The most successful local suppliers have been those that have developed an export capability and are providing goods and services to petroleum operations in Australia and other countries. This enhances their competitiveness and provides continuity of work that is not available by relying solely on the Australian market.

Project proponents are working with local suppliers and governments to identify such opportunities and improve industry competitiveness. Governments are assisting by promoting Australian suppliers globally, by helping suppliers become more competitive and able to meet their skilled labour needs through training and migration programs and by providing required infrastructure.

Consistent with the *National Framework*, the Australian Government announced in May 2011, a *Buy Australian at Home and Abroad* program to facilitate Australian

industry participation in major resources projects. The Industry Capability Network is being strengthened by having specialist advisers working in project teams and a Resource Sector Supplier Advisory Forum is being established to consider how the resources sector and Australian suppliers can work together to improve access and competitiveness. In August, Mr Peter Beattie was appointed as Australia's first Resources Sector Supplier Envoy to assist with identifying opportunities for local manufacturers and service providers to provide increased participation in Australian major resource projects.

At the Future Jobs Forum on 6 October 2011, the Australian Government announced that major project developers seeking a five per cent tariff exemption under the Enhanced Project By-Law Scheme would be required to provide more detailed information on a public website about opportunities for Australian suppliers.

The West Australian Government announced a new *Local Industry Participation Framework* on 1 July 2011. The WA framework includes a *Building Local Industry Policy* that is consistent with the *National Framework* and sets out several WA-specific initiatives such as the development and promotion of procedural guidelines and improved methods of information dissemination and communication.

2.3 Key policy developments

Changes in several key areas of government policy create both challenges and opportunities for the upstream oil and gas industry. Much of the public policy debate during 2011 has been centred on taxation reform and climate change.

2.3.1 Taxation

As noted previously, taxes and royalties account for around half of the industry's pre-tax profit. In addition, the rates at which taxes and royalties are levied have a large impact on project economics, particularly on the economics of high-cost, long-life, low-return gas projects. Taxation reform has therefore always been a key area of interest for the upstream industry. This was again confirmed in 2007 when *Platform for Prosperity* found improving the fiscal framework for gas projects could deliver significant economic and tax revenue benefits that would help maximise community returns from petroleum development.

Unfortunately, *State of the industry 2010*, found that of the strategy's seven high value-adding priorities, the one in which the least progress has been made is improvements in fiscal terms for gas projects, even though the proposed changes could significantly boost industry growth at minimal long-term cost to government revenue.

In recent years the debate around tax reform has been largely framed by the National Review of Taxation chaired by Dr Ken Henry AC and the government's initial

response to its report in 2010. The industry identified a range of measures for improving the efficiency and competitiveness of the tax and royalty system but the main change to emerge was a decision by the Australian Government in July 2010 to extend the Petroleum Resource Rent Tax (PRRT) to onshore areas and the North West Shelf Project. In response, the industry pointed out applying PRRT in addition to existing resource taxes, could impose significant administrative costs on onshore operators and the government in return for marginal revenue gains. The industry also noted that a range of technical issues arising out of more than 20 years of experience with the offshore PRRT should also be resolved. Following a lengthy consultation process, legislation to give effect to the decision to extend PRRT was introduced to parliament on 2 November 2011. The changes are to apply from 1 July 2012

Unfortunately this reform will not deliver the improvements in taxation efficiency and competitiveness that the industry seeks. The only way to make big gains is by addressing the distortions in the company tax system that are disadvantaging investment in capital intensive projects like LNG and handicapping Australian LNG projects against their overseas competitors.

The tax reform process must also recognise the opportunity to attract much more exploration to the large parts of Australia's onshore and offshore basins that remain largely unexplored. Such exploration could yield substantial national wealth but Australia's fiscal terms for high-cost, high-risk frontier exploration remain relatively unattractive.

2.3.2 Climate change policy

There has also been considerable debate about the policy approach to be taken to reducing the growth in Australia's greenhouse gas emissions. The *Clean Energy Future* legislation passed by parliament on 8 November 2011 will apply a price to carbon emissions from 1 July 2012. The carbon price will be fixed at \$23 per tonne of carbon dioxide in the first year, increasing by 2.5 per cent a year in real terms for the following two years and then transitioning to a flexible price, cap-and-trade emissions trading scheme from 1 July 2015.

The industry has consistently supported a national climate change policy that delivers abatement at least cost and facilitates investment decisions consistent with there being an international price on carbon. It has also pointed to the much greater role that natural gas could play in reducing the emissions intensity of Australia's electricity sector and in reducing global greenhouse gas emissions. In Australia, electricity generated from natural gas produces 50 to 70 per cent fewer greenhouse gas emissions than an existing coal-fired power station. Studies by Worley Parsons have concluded that for every tonne of greenhouse gas emissions generated by the production of LNG in Australia, between 2.5 and 9.5 tonnes of emissions are avoided globally when this LNG is substituted for coal in electricity generation.



Australian LNG offers global environmental benefits.

Lifecycle LNG vs coal emissions

In March 2011, Woodside Energy released a comparison of the lifecycle greenhouse gas emissions from the use of North West Shelf LNG compared to Hunter Valley coal for electricity generation in China (Worley Parsons 2011a). The comparison of LNG used in a combined-cycle gas turbine (CCGT) with subcritical coal (the dominant coal combustion technology in China) revealed that the use of NWS LNG instead of coal would avoid global emissions of:

- 0.58t CO₂-e per MWh generated, taking into account the full lifecycle emissions of both fuels from extraction and processing in Australia, to shipping and power generation in China
- 9.5t CO₂-e for every tonne of CO₂-e released in Australia in the LNG production process.

The following month APPEA released a lifecycle comparison of the greenhouse gas emissions from CSG-LNG and Australian black coal, which as before covered emissions from extraction and processing in Australia to combustion in China for power generation (Worley Parsons 2011b). Again comparing CSG-LNG used in a CCGT with subcritical coal, the study found that the use of CSG-LNG instead of coal would avoid global emissions of:

- 0.48t CO₂-e per MWh generated, taking into account full lifecycle emissions of both fuels
- up to 4.3t CO₂-e for every tonne of CO₂-e emitted in Australia from the production of CSG-LNG.

Policy measures such as the emissions trading scheme must not disadvantage Australia's gas industry by imposing a cost on LNG production that is not borne by Australia's competitors.

These competitors are mostly based in Asian, Middle Eastern and African countries that have yet to adopt carbon pricing regimes (and, in many cases, are unlikely to do so in the foreseeable future).

The introduction of a market-based carbon pricing mechanism must also be accompanied by the withdrawal of state and Commonwealth programs that are costly and inconsistent with the least-cost abatement objective of carbon pricing.

Studies by the Productivity Commission, Grattan Institute, Ausgrid, the WA Economic Regulation Authority and others have concluded that many of Australia's grant tendering schemes and rebates for renewable energy have imposed high costs on consumers for very little reduction in greenhouse gas emissions.

The current debate about greenhouse gas policy therefore provides both an opportunity and a challenge for Australia's gas industry.

There is an opportunity to help reduce greenhouse gas emissions in Australia and elsewhere. The challenge is to do so through a market-based mechanism in place of the current suite of inefficient and costly programs and subsidies.

2.3.3 Energy policy

A broadly based energy policy should identify the policy settings that will most effectively and efficiently achieve the government's objectives across a range of policy portfolios. It should provide a set of policy principles against which proposed new measures can be assessed and so help to ensure that policies and programs are consistent and are achieving their goals at least cost.

A national energy policy could provide the mechanism for addressing impediments to the growth of Australia's energy sector and for coordinating government initiatives and policy settings. The development of a national Energy White Paper commenced in 2008 but stalled as the debate about emissions trading and tax reform took centre stage. Work has resumed over recent months. A draft White Paper is expected before the end of 2011 and a final White Paper during 2012. If the Australian Government, in consultation with industry, can bring this process to a satisfactory conclusion, it will provide a whole-of-government framework within which policies affecting the energy sector can be assessed, developed and implemented.

The Western Australian Government is expected to shortly release its own energy policy statement, *Strategic Energy Initiative Energy 2031*, following a two-year consultative process. This framework will set out a plan for meeting the state's energy needs for the next 20 years and defines a set of principles to guide policy development over that period.

The Queensland Government has also implemented a process for reviewing the Queensland gas market each year. The second of these reviews was completed in 2011 with the aim of informing government decision-making and other stakeholders on the development of a more competitive Queensland gas market.

2.3.4 Approvals processes and access to resources

Approvals processes and access to resources is a key issue for the oil and gas industry and has been the subject of considerable policy review and development by governments over recent years.

In 2009, the Productivity Commission's *Review of the Regulatory Burden on the Upstream Petroleum (Oil and Gas) Sector* and an independent review of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were released. Around the same time, the West Australian and Queensland Governments conducted several independent and internal reviews of approvals processes affecting the resources sector.

While some significant reforms have been implemented, including streamlining offshore regulations down from thirteen regulations into three, many others are yet to be actioned. As a result, there is still a long way to go to achieving the major, broadly-based improvement in approvals efficiency that the industry proposed in *Platform for Prosperity* more than four years ago.

Changes to the structure and responsibilities of regulating agencies are being implemented as a result of the PC review and Montara incident.

Policy responses must be balanced, fact-based and enduring.

However, changes to institutional arrangements alone will not necessarily improve the efficiency, transparency and predictability of regulation and approvals processes. Problems with current approvals processes continue to grow. The extent of overlapping approvals requirements for example, is increasing with many regulators requiring oversight of the same, or similar, documentation and procedures.

Timelines for assessing offshore drilling applications have increased and become more unpredictable.

Hence, priority should now be given to introducing process reforms on a broader and more significant scale than has been achieved to date.

In addition, the expansion of the oil and gas industry into new areas and projects focused on non-traditional resources, such as shale gas, tight gas or coal seam gas, has further increased the strain on the approvals system.

The growth of the CSG industry in Queensland and potential projects in NSW and Victoria has raised new approvals and regulatory issues. Policy responses by governments must be balanced, fact-based and enduring and not a short-term reaction to particular interest groups. The many inquiries and bills before parliament related to the CSG sector are adding to uncertainty for investors.

The industry has been pleased with the consultative approach taken by governments towards developing new processes and modifying existing ones. These include, for example, Queensland's new land access framework and policies related to water management and strategic cropping land, and policy development processes in NSW.

However, there must also be a continuing focus on implementing reforms to ensure that environmental, heritage and other objectives of approvals processes are achieved as efficiently as possible.

3 Progress towards targets

3.1 Liquids production

Oil, condensate and naturally occurring LPG production as a proportion of liquid fuels consumption is, on average, maintained at the 2006 level of 55 per cent or better.

3.1.1 Performance to date

Australia's production of crude oil, condensate and naturally occurring LPG as a proportion of petroleum products consumption, increased to 52.9 per cent in 2010, from 48.1 per cent in 2009 (Table 2). Over the five-year period from 2006 to 2010, the ratio has averaged 53 per cent, two percentage points below the strategy target of 55 per cent.

Table 2 Australia's production and consumption of petroleum liquids: 2006 to 2010

Year	Production (PJ)	Consumption (PJ)	Ratio (%)
2006	1081	1968	54.9
2007	1118	2000	55.9
2008	1102	2062	53.4
2009	997	2072	48.1
2010	1105	2090	52.9

Sources: APPEA 2011, ABARES 2011b

The increase in liquids production in 2010 is almost entirely due to a 19.9 per cent increase in crude oil production. Condensate declined by 0.8 per cent while LPG production increased by 3.2 per cent.

The increase in oil production, from 94.2 million barrels in 2009 to 113 million barrels in 2010 is the result of the commissioning of the Van Gogh and Pyrenees developments in early 2010. These are Australia's largest new oil projects for several years. The Ningaloo Vision floating production, storage and offtake vessel (FPSO) has a production capacity of 63 thousand barrels a day (kbd) and the Pyrenees Venture FPSO can produce up to 96kbd. Their combined production of 37.5 million barrels for the year more than offset declines at most of Australia's other producing oil fields.

Oil production from the North West Shelf Project resumed in September 2011 when a new FPSO (the Okha) commenced production as part of the A\$1.8 billion North West Shelf Oil Redevelopment Project. The Okha replaced the Cossack Pioneer FPSO which had been in operation since 1995. The North West Shelf fields of Wanaea, Cossack, Lambert and Hermes have yielded 424 million barrels of oil since that time and the Okha will access the remaining 88.2 million barrels of proved and probable reserves and extend the production life of these oil fields to beyond 2020. Steady state production from the Okha is around 30kbd.

There can be long delays between a field's discovery and the start of production. The precursor to the Pyrenees project was a gas show in the first well drilled on the West Murion structure in 1972 and the eventual discovery of Pyrenees in 1993 (West Murion 5). It then took another 17 years before production commenced in 2010. The Kipper accumulation discovered 25 years ago (in 1986) has yet to enter production.

A constant succession of major oil discoveries being developed in short timeframes is needed to maintain Australia's current rate of liquid fuels production. However, this has not occurred as there have been no significant additions of 100 million barrels or more to Australia's known liquids reserves since 2008 (Figure 8).

Figure 8 Australia's liquids discoveries: 2000 to 2010

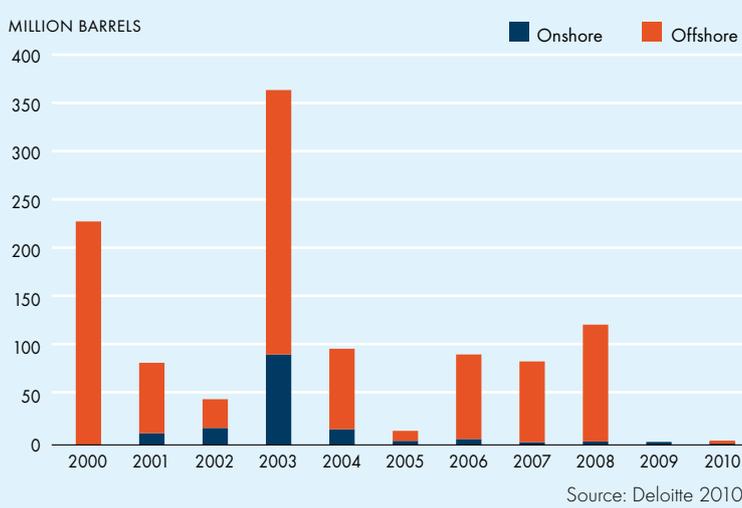
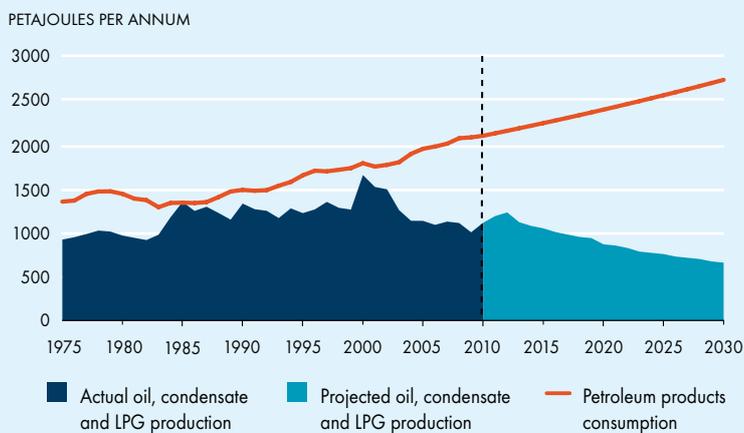


Figure 9 Australia's actual and projected liquid fuels production and consumption: 1975 to 2030



Sources: APPEA 2011, ABARE 2010a, ABARES 2011b

Over the five years from 2006 to 2010, less than 300 million barrels of liquids were discovered whereas Australia consumed more than 1500 million barrels of refined petroleum products (ABARES 2011b).

New projects are also needed to offset declining production from currently producing fields and the closure of projects that have reached the end of their economic lives.

The Legendre oil project for example, ceased production in March 2011 after ten years of operation. No greenfields oil projects of a similar scale to Van Gogh and Pyrenees are currently under development. As significant as they are, the Van Gogh and Pyrenees developments provide only a modest boost to Australia's liquids production without altering the declining long-term trend (Figure 9).

As shown in the graph, without a steady succession of new oil field developments the gap between Australian liquids production and consumption will increase.

ABARES' projections indicate that the production to consumption ratio will fall to 42 per cent in 2017 and 24 per cent by 2030. In that case, the ratio over the eleven years from 2007 to 2017 inclusive would average just over 50 per cent, well short of the strategy target of 55 per cent.

Five percentage points may not seem large, but the shortfall in production, added up over an 11-year period, amounts to almost 200 million barrels. At recent prices, this represents lost income to the nation of around \$20 billion.

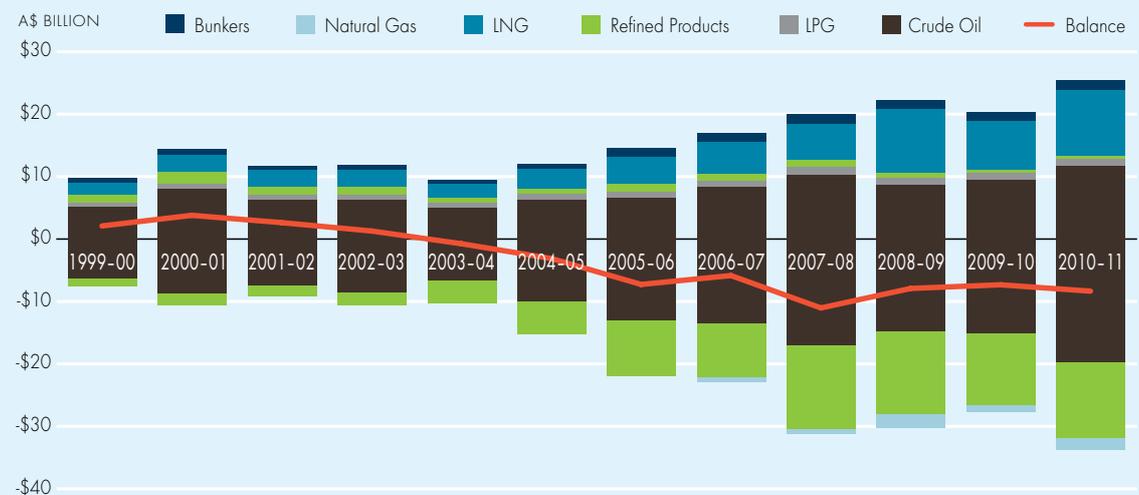
3.1.2 New projects

For the next few years at least, new oil field developments are expected to be of a smaller scale than Van Gogh and Pyrenees or as tie-backs to existing production facilities:

- Apache Corporation and its partners are developing the Coniston oil field as a tie-back to the Van Gogh FPSO. The project is expected to cost US\$537 million and to start production in mid 2013 at an average rate of 22kbd.
- Apache is also operator of a \$438 million FPSO development of the Balnaves field off the northwest coast. The field is believed to contain recoverable resources of 17 million barrels of oil and 30 billion cubic feet (bcf) of gas. Production is scheduled to commence in 2014 and the field will have a peak production rate of 30kbd.
- PTTEP plans to restart production from the Montara field during the first quarter of 2012. The wellhead platform has been rebuilt with a capacity of 35kbd.
- Santos is planning to develop the Fletcher and Finucane South oil fields discovered in 2009 and May 2011 respectively. These will be tied back to the Exeter Mutineer FPSO, where output has dropped to about 8kbd (compared to its original production capacity of 100kbd). A final investment decision for the Fletcher-Finucane subsea development is targeted for early 2012 and the project is expected to commence production in late 2013 at an initial rate of 50kbd.
- Woodside Energy is considering development of the Cimatti oil field discovered in 2010 as a possible tieback to the Enfield FPSO. Startup by 2014-15 is possible.
- Woodside is also considering options for developing the Laverda oil field discovered in 2000. Recent drilling has indicated potential oil resources of 100 million barrels and three further appraisal wells are planned in the latter part of 2011.
- Feasibility studies on the development of the Lady Nora oil discovery are being conducted by Woodside Energy. This field, in the Greater Western Flank area of the North West Shelf Project, is estimated to have around 100 million barrels of reserves.

Three of the projects reported in *State of the industry 2010* have been delayed and/or suffered significant cost increases.

Production from the Kipper and Turrum fields in the Bass Strait is now expected to start in 2013 as part of the \$4.4 billion Kipper Tuna Turrum development. The Kipper

Figure 10 Australia's petroleum trade: 1999-00 to 2010-11

Source: BREE 2011

field holds about 620bcf of recoverable gas and 30 million barrels of condensate and LPG. The Turrum field holds about 1 tcf of gas and 110 million barrels of oil and natural gas liquids. As part of the Kipper Tuna Turrum development, the Tuna reservoir will be further developed to produce gas and associated liquids. The Turrum and Tuna fields are being developed by the Gippsland Basin Joint Venture (Esso Australia and BHP Billiton) while Kipper is being developed by Esso Australia, BHP Billiton and Santos.

The Crux liquids project in the Timor Sea has also been delayed as the operator (Nexus Energy) seeks a new partner and arranges finance. Nexus is targeting an investment decision in late 2011 in a production facility with a capacity of 38kbd of condensate, with production commencing in 2014.

In addition, following a major reserves downgrade, production from the Basker-Manta-Gummy project in the Gippsland Basin was suspended in late 2010. Beach Energy and its joint venturers are evaluating options for a potential second phase of gas and liquids recovery.

Some of the recently committed and proposed conventional gas LNG projects could also add to Australia's liquids production over the longer term.

The Prelude LNG project being developed by Shell and scheduled to start production in 2016 has condensate reserves of 120 million barrels. In addition to 12.8tcf of gas, the Ichthys field has 527 million barrels of condensate which if developed as planned, could add

100kbd to Australia's liquids production from 2016. The Greater Western Flank area being considered for development by the North West Shelf Venture comprises 14 fields with a total of 3tcf of recoverable gas reserves and 100 million barrels of condensate.

Many gas fields have little or no associated liquids. Gorgon gas for example is relatively dry as is the gas in the Io-Jansz and Scarborough fields. CSG has no associated petroleum liquids.

3.1.3 Petroleum trade balance

As indicated in Figure 10, Australia has gone from a position where ten years ago the value of its petroleum exports slightly exceeded the value of imports, to now running a sizeable petroleum deficit.

Over the past four years Australia's petroleum trade deficit has averaged around \$8.6 billion a year, including a deficit of \$8.3 billion in 2010-11.

Increasing LNG production is adding to export revenue but cannot offset the rapidly rising oil import bill unless the pace of major new oil field discoveries and developments accelerates.

A growing reliance on imports of oil and refined petroleum products means that Australia is foregoing the income, jobs and other benefits that would flow from the development of its own liquids resources. It could also have longer-term implications for Australia's energy security.

3.2 LNG capacity

LNG production capacity increases from 20 million tonnes a year in 2008 to at least 50 million tonnes a year in 2017.

3.2.1 Performance to date

Since *State of the industry 2010* five new LNG projects have proceeded to final investment decisions and are now under construction. Assuming all of these and the Gorgon and Pluto projects are developed along the timelines and with the capacities currently proposed, Australia's LNG production capacity will reach more than 72 million tonnes per annum (mtpa) by 2017 (Figure 11).

Since the commissioning of its 5th LNG train in 2008, the North West Shelf Project has had a production capacity of 16.3mtpa. The joint venturers are continuing to invest heavily in the project to maintain gas and liquids production. The \$5 billion North Rankin Redevelopment, sanctioned in March 2008 and expected to be operational in 2013, involves installing a new offshore platform and associated facilities to access the remaining reserves in the North Rankin and Perseus fields. Planning is underway for the Greater Western Flank which will enable up to 14 smaller fields to be developed. It will be a phased development with the first phase being a subsea tieback to the Goodwyn platform. A final investment decision is targeted for 2012.

The Darwin LNG project started production in 2006 and has a capacity of 3.5mtpa. The Pluto project is expected to start production in early 2012 with a capacity of 4.3mtpa and the Gorgon project in 2014 with a capacity of 15mtpa. On 26 September 2011, Chevron, Apache Energy, Shell and Kufpec (the Kuwait Foreign Petroleum Exploration Company) announced their decision to proceed with the Wheatstone LNG project. The project is expected to start production in 2016 with a capacity of 8.9mtpa.

With many conventional and unconventional projects on the drawing board, Australia boasts more proposed liquefaction capacity than any other country. Pluto expansion, Wheatstone, Browse, Ichthys, Prelude and Sunrise and a number of coal seam gas projects are expected to reach final investment decisions in the next 18 months.

Woodside 2011

The Australian LNG industry is leading the world in the use of new sources of gas and new technologies. To date, LNG projects around the world have been based on conventional natural gas processed through land-based LNG trains. However, since late 2010 four LNG projects have reached final investment decisions and are now under construction using technologies never before applied. The Queensland Curtis, Gladstone LNG and Australia Pacific LNG projects will be the first LNG projects in the world to convert CSG to LNG (CSG-LNG). The fourth innovative project will use conventional gas but not have land-based processing facilities. Shell will process gas from the remote Prelude and Concerto fields in the Timor Sea using a 488 metre long, 74 metre wide floating LNG production (FLNG) facility. This vessel will be located 475 kilometres northeast of Broome and 200 kilometres from the nearest point on the mainland.

CSG-LNG enables gas resources to be developed on a much bigger scale than would be possible from relying on only the Australian gas market and FLNG enables wealth to be created from smaller, more remote gas fields that would previously have been uneconomic to develop.

Shell has a contract in place which would allow several FLNG facilities to be built for use worldwide. Other companies—including PTTEP Australasia, Woodside Energy and GDF Suez in partnership with Santos—are proposing FLNG facilities on other gas fields in Australia's northwest.

3.2.2 Global LNG supply

Australia has 52.6mtpa of LNG capacity under construction and at least another 70mtpa of capacity on the drawing boards. This prompts the question as to whether there will be sufficient growth in global LNG demand at high enough prices to support all of these projects as well as the large number of projects being planned in other countries.

Figure 11 Australia's LNG production capacity (existing and under construction)

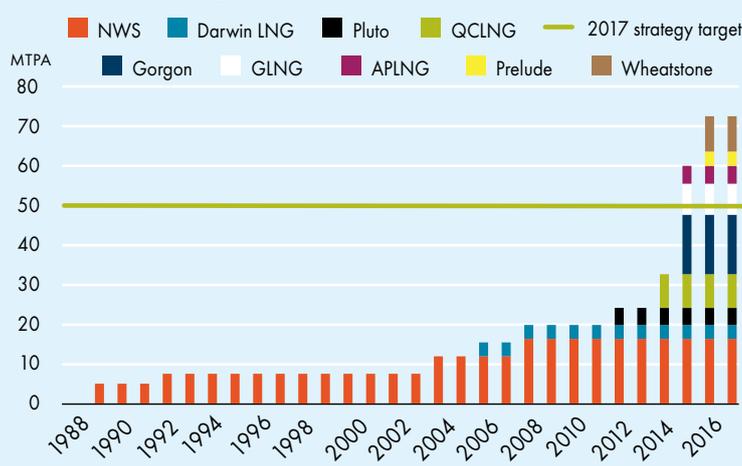


Table 3 Major Australian LNG projects and expansions under construction and proposed

Project	Participants	Location	FID(1)	Targeted start-up	LNG capacity (mtpa)	Capital cost
Projects under construction						
Gorgon	Chevron, Shell, ExxonMobil	Carnarvon Basin, Barrow Island	2009	2014	15.0	A\$43b
Pluto	Woodside Energy, Kansai Electric, Tokyo Gas	Carnarvon Basin, Burrup Peninsula	2007	2012	4.3	A\$14.9b
Queensland Curtis LNG	BG Group, CNOOC, Tokyo Gas	Bowen/ Surat basins, Gladstone	2010	2014	8.5	US\$15b
Gladstone LNG	Santos, Petronas, Total, Kogas	Bowen/ Surat basins, Gladstone	2011	2015	7.8	US\$16b
Prelude FLNG	Shell	Browse Basin, floating LNG	2011	2016	3.6	na
Australia Pacific LNG	Origin, ConocoPhillips, Sinopec	Bowen/ Surat basins, Gladstone	2011	2015	4.5	US\$14b
Wheatstone LNG	Chevron, Apache Energy, Shell, Kufpec	Carnarvon Basin, Onslow	2011	2016	8.9	A\$29b
Projects under consideration						
Pluto Expansion	Woodside Energy	Carnarvon Basin, Burrup Peninsula	na	na	na	na
Ichthys	Inpex, Total	Browse Basin, Darwin	2011	2016	8.4	US\$20b
Australia Pacific LNG Train 2	Origin, ConocoPhillips	Bowen/ Surat basins, Gladstone	2012	2016	4.5	US\$6b
	PTTEP Australasia	Timor Sea, floating LNG	2012	2016	2	na
Browse LNG	Woodside Energy, BP, BHP Billiton, Chevron, Shell	Browse Basin, Broome	2012	2017	Up to 15	na
Sunrise	Woodside Energy, Shell, ConocoPhillips, Osaka Gas	Bonaparte Basin, floating LNG	2012	2017	4	na
Arrow LNG Plant Project	Shell, Petrochina	Bowen/ Surat basins, Gladstone	2013	2017	8	na
Gorgon Train 4	Chevron, Shell, ExxonMobil	Carnarvon Basin, Barrow Island	2013	na	5	na
Bonaparte	GDF Suez, Santos	Bonaparte Basin, floating LNG	2014	2018	2	na
Fisherman's Landing	LNG Ltd	Bowen/ Surat basins, Gladstone	2013-14	na	3.0	US\$805m (1st train) US\$300m (2nd train)
Newcastle LNG	Eastern Star Gas	Newcastle	2012	2015	1 (initially) 4 (ultimately)	na
Scarborough Gas	ExxonMobil, BHP Billiton	Carnarvon Basin, Onslow	na	na	6	na
Tassie Shoal LNG and Methanol Project	Methanol Australia, Air Products and Chemicals	Timor Sea	na	na	3mtpa LNG 3.5mtpa methanol	US\$2.1b

1 FIDs beyond 2011 are target dates na: not available

Source: ABARES 2011a

Algeria and Angola each have 5.2mtpa of capacity currently under construction, Indonesia 2mtpa and PNG 6.6mtpa, all to start production by 2015 (IEA 2011). The IEA estimates that around the world a further 370mtpa of liquefaction capacity is being evaluated to enter the market post 2015. That is, Australia is competing with almost 300mtpa of capacity being proposed in countries like Russia, Nigeria and Iran. Qatar, with 77mtpa of capacity now, could add to this through debottlenecking, and new plants could be added beyond 2020 if the country's moratorium on new developments is lifted. Meanwhile, other countries such as Brazil, Venezuela and Cameroon are seeking to develop LNG industries. Thanks to the growth in unconventional gas production, LNG exports from the US and Canada also seem increasingly likely.

Of all these countries, Australia has the largest number of new project proposals. However, these account for just a quarter of the potential new supply capacity on offer around the world. Hence, LNG buyers have plenty of choice.

3.2.3 LNG demand

As noted previously, global gas demand is expected to increase at an average rate of 2 per cent a year over the next two to three decades with the highest rates of growth occurring in non-OECD Asia (particularly China). World LNG trade is expected to grow twice as fast as global gas production from 212mtpa in 2010 to around 400mtpa in 2020 (Macquarie 2011a). McKinsey estimate that the Fukushima disaster is likely to result in 9 to 18mtpa of additional LNG demand by 2020 (McKinsey 2011). Demand for LNG in the Asia-Pacific

region is expected to increase by around 60mtpa to reach 190mtpa by 2020, despite new investment in inter-regional gas pipelines and increased indigenous gas production (including unconventional gas) (Woodside 2011).

In April 2011, IHS CERA estimated that around 100mtpa of the region's LNG requirements in 2020 are uncontracted. Around half of this (50mtpa) is expected to be supplied from existing and committed projects and a further 10mtpa to be supplied from Qatar. This leaves just 40mtpa to be supplied by new projects, well short of the 140mtpa of new Pacific Basin capacity currently being proposed (IHS CERA 2011a). The amount yet to be sourced from new projects may now be even less than the 40mtpa estimated by IHS CERA as a result of the signing of new sales contracts by the LNG projects that have proceeded since April 2011 (including Australia Pacific LNG and Wheatstone).

This and other demand analyses confirm that LNG buyers have plenty of choice and proposed Australian projects face considerable competition for new markets.

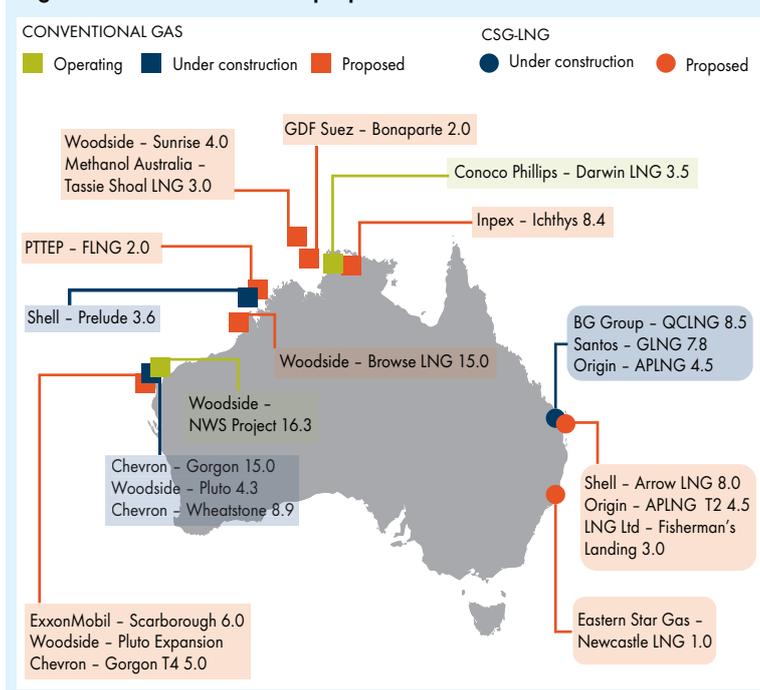
3.2.4 Australia's competitive position

It is widely recognised that most of the new LNG projects being proposed for development in Australia are relatively high cost, compared to other proposed projects around the world (see for example Figure 10, *State of the industry 2010*). Furthermore, as noted earlier, cost pressures in Australia are intensifying as a result of skills and capacity shortages generated by the surge in minerals and energy investment. Over the past 20 years Australia has never had more than two LNG mega projects under construction at the same time. There are now six onshore LNG plants under construction (Pluto, Gorgon, Gladstone LNG, Queensland Curtis LNG, Australia Pacific LNG and Wheatstone) with a total of 11 LNG trains. These are all competing for skills and resources. Should another one or two projects or expansions proceed, up to 14 LNG trains could be under construction simultaneously across Australia. This has never been attempted anywhere in the world, including in Qatar, the world's largest LNG producer.

At the same time the iron ore industry and other parts of the mining industry are also investing at unprecedented rates. Analysts such as Macquarie Equities warn that the resulting cost increases and project delays could mean projects either fail to proceed or end up generating unacceptably low rates of return for their investors.

To protect against this, Macquarie expects that when making investment decisions, Australian project proponents will require higher rates of return than would normally be the case. This will be needed to compensate for growing development constraints and cost pressures and the risks stemming from increasing union power and adverse government policies such as changes to resource taxation and carbon pricing. The carbon pricing scheme

Figure 12 Australian LNG projects



Australian greenfields projects are getting precariously close to becoming priced out of the market as a more competitive longer-term LNG market outlook threatens to expose Australia's higher cost base.

Macquarie 2011a

to apply from 1 July 2012 will add a significant new cost to all Australian LNG projects that will not be borne by overseas competitors and that cannot be passed on to customers.

Increasing risks and costs will mean that investors in Australian LNG projects must secure attractive prices thereby

limiting their ability to compete on price. As a result new Australian LNG projects risk being priced out of the market.

In summary, it is clear that Australia is facing an unprecedented opportunity to rapidly expand its gas industry, generating considerable wealth for the country and helping to reduce local and global greenhouse gas emissions. However, there are significant threats to the industry's competitive position and strong competition from many other lower cost projects in other countries. Therefore to make the most of this once-in-a-lifetime opportunity, the industry and governments must work together to address these threats. Ways of reducing costs and risks need to be defined and implemented quickly. These should include a number of the measures proposed in the Upstream Oil and Gas Industry Strategy.

3.3 Gas-fired electricity generation

In a competitive electricity market, 70 per cent of all new electricity generation capacity installed in Australia over the decade to 2017 is gas-fired.

3.3.1 Performance to date

A total of 11,384MW of electricity generation capacity has been commissioned since 2007 or is currently under construction (ESAA 2011). Of this, 12.6 per cent is coal-fired, 61.3 per cent gas-fired, 24.8 per cent use renewable forms of energy (mostly wind and hydro) and 1.3 per cent uses oil products.

Over the past year, the division between gas and renewable energy as the fuel source for electricity generation has shifted in favour of renewables. *State of the industry 2010* reported the gas and renewables shares of new generation as being 66.7 per cent and 20.8 per cent respectively. This shift is primarily the result of construction starting on the A\$1 billion Macarthur wind farm in Victoria in August 2010. This project involves installing 140 wind turbines of 3MW capacity (total capacity of 420MW). Upon completion in early 2013, it will be the largest wind farm in the southern hemisphere and one of the largest in the world.

Since mid 2010 there have been no new commitments to major gas-fired generation projects although a number are at an advanced stage of planning with government approvals received or underway. Proposed CSG-based generation projects include:

- Braemar 3 expansion by ERM Power near Dalby Queensland to provide 520MW of new capacity
- Darling Downs Power Station expansion by Origin Energy near Brisbane (500MW)
- Spring Gully, a new power station near Roma, Queensland to be built by Origin Energy with an initial capacity of 500MW, expanding to 1000MW

- a new power station at Narrabri to be built by East Coast Power with an initial capacity of 30MW expanding to 210MW.

Proposed projects using conventional gas include:

- two projects on the NSW south coast, Bamarang (Delta Electricity of up to 500MW over two stages) and an expansion of the Tallawarra project (AGL, 300-450MW)
- major gas-fired generation projects in the central highlands region of NSW south of Sydney including the Kerrawary Power Station (Origin Energy, up to 1000MW), Dalton Power Station (AGL, 250-780MW), Hanging Rock (Loran Energy Products, 2x 300MW), Leafs Gully (AGL, 360MW), Marulan (Energy Australia, 350MW), Marulan (Delta Electricity, up to 500MW) and Wellington (ERM Power, 640MW)
- projects in southern Victoria including expansion of the Mortlake project (Origin Energy, 450MW), Shaw River project (Santos, 500MW in Stage 1, increasing to 1500MW in Stages 2 and 3) and Yallourn Power Station (TRU Energy, 1000MW)
- a 700MW expansion of the Torrens Island Power Station in South Australia by AGL
- two projects in Queensland being planned by TRUenergy (Blackstone at Ipswich and Aldoga at Gladstone) each with an initial capacity of 500MW potentially increasing to 1500MW.

Reduced Australian greenhouse gas emissions

Achievement of the strategy's gas-fired electricity generation target is estimated to avoid around 18 mtpa CO₂-e of Australian greenhouse gas emissions by 2017.

If it is assumed that a 70 per cent share of new generation capacity translates into a 70 per cent share of the growth in Australian electricity production, then over the ten years to 2017, gas-fired electricity production could increase by 43TWh.

Generating this in a combined-cycle gas plant would result in lifecycle emissions of 18mtpa CO₂-e (0.42t CO₂-e/ MWh) while generation from new supercritical black coal plant would result in lifecycle emissions of 36mtpa CO₂-e (0.84t CO₂-e/MWh).

ABARES 2010a, ACIL Tasman 2009

This considerable list of proposed projects may appear to augur well for the future expansion of the gas-fired generation sector. However, market constraints mean that not all projects will proceed in the timeframes being proposed. In addition, the list of proposed renewable projects is many times longer with almost 100 projects included in ABARES' latest listing of major electricity generation projects (ABARES 2010b).

Government support for renewable energy is much greater than that for gas. In addition to the Renewable Energy Target (RET) and a long list of other renewable energy support programs, additional measures were included in the carbon price package announced by the government in July.

A Clean Energy Finance Corporation will invest \$10 billion over five years in renewable energy and low emission technologies and an Australian Renewable Energy Agency established to administer grants for renewable energy projects totalling \$3.2 billion over nine years.

Inefficient gas-fired generation

ACIL Tasman has estimated that the RET will see 9500MW of wind generation built by 2020 requiring as much as 6650MW of open-cycle gas turbine support. Such a large investment in variable gas plant output will impose very peaky fuel usage and require the sector to pursue some unconventional approaches, including storing gas underground and in pipelines to await demand.

According to Origin Energy, the cost of reducing carbon emissions through wind and gas peaking generation is in the order of \$40 a tonne more expensive than substituting gas for coal in baseload operations.

Orchison 2010

Subsidies for renewable energy place gas-fired generation at a significant competitive disadvantage and impose a significant efficiency loss on the Australian economy.

Subsidised solar photovoltaic (PV) systems for example, have reduced gas usage by Western Australian households even though gas can deliver emissions reductions at a much lower cost.

The Productivity Commission estimated that the implicit abatement subsidy for solar PV is between \$431 and \$1043 per tonne of CO₂.

These schemes are economically inefficient because a large proportion of the costs are borne by taxpayers and other electricity customers rather than by the owners of solar systems. Similarly, the RET has a high cost of emissions abatement of \$42-\$129 per tonne of emissions avoided. The small-scale component of the RET, which includes solar PV, has a cost of \$152-\$525 per tonne of CO₂ (PC 2011).

Increased penetration of solar PV and wind power systems will require increased investment in back-up capacity in order to maintain power system stability and to meet fluctuations in power demand. Open-cycle gas turbines are well suited to this task. However, for much of the time this capacity is sitting idle and when it is used, it is less energy and greenhouse efficient than a combined-cycle plant commonly used for baseload generation.

In 2009-10 the utilisation rate of gas-fired plant averaged just 28 per cent compared to 62 per cent for power plants using black coal and 87 per cent for brown-coal plant (ESAA 2011). This suggests that the growth in gas usage for electricity generation is lagging behind the growth in gas-fired capacity. Less gas is being used (due to the low utilisation rate) and it is being used less efficiently (in open-cycle rather than combined-cycle plant).

These lost opportunities for least-cost abatement could be avoided by reducing the growth in intermittent forms of subsidised renewable energy and by increasing investment in gas-fired baseload and intermediate power generation.

As has been repeatedly stated since the release of *Platform for Prosperity* four years ago, achieving the Oil and Gas Industry Strategy's target for electricity generation depends on developing competitive electricity and gas markets free from tax- and subsidy-related distortions.

Without that, it will not be possible to achieve the goal of 70 per cent of all new generation capacity installed in Australia over the decade to 2017 being gas-fired. Nor will it be possible for the nation to fully capture the greenhouse gas abatement potential of its gas resources. Distortions in the electricity market not only affect the gas industry. More importantly, they result in efficiency losses for the economy, higher electricity prices for Australian businesses and consumers and a loss of national income.

3.3.2 Domestic gas supply

Growth in gas-fired electricity generation and in the demand for gas in other sectors of the economy is being met by high levels of investment in new gas supply projects. Indeed, Australia has abundant gas resources and could be making much greater use of them to meet national energy needs at least cost and to reduce the growth in the country's greenhouse gas emissions. In response to increasing demand for gas, both locally and in export markets, Australia is experiencing a surge of investment in gas production infrastructure. Apart from the jobs and businesses supported by this investment, the expansion of Australia's gas supply capacity is delivering major long-term benefits in the form of increased gas market competition, supply security and competitive pricing. Governments also benefit through increased collections of taxes and royalties.

Gas supply capacity in the eastern states market is being greatly increased by the CSG industry's rapid expansion. Western Australia is experiencing the greatest increase in domestic gas supply capacity in over two decades and the Northern Territory's gas market is expanding as a result of improved long-term security of supply.

Eastern states

As noted in section 2.1.1, CSG now supplies around one third of the eastern states gas market and its market share is likely to continue to grow strongly on the back of increased investment in production infrastructure to supply new LNG projects.

The traditional sources of gas supply, Bass Strait and the Cooper Basin, continue to attract new investment and make a major contribution to the eastern states market. In Australia's southeast, the Longtom gas project in the Gippsland Basin and Henry gas project in the offshore Otway Basin started production in 2009 and 2010 at rates of around 68 and 30 terajoules per day (TJ/d) respectively. The Kipper Tuna Turrum gas/liquids development in the Bass Strait is expected to start production in 2013 (see section 3.1.2 for details). The fields hold enough energy to power a city of a million people for 35 years.

Origin Energy is currently assessing the viability of developing the Halladale and Black Watch gas fields in the Otway basin. These are estimated to contain 55PJ of gas and condensate reserves which could potentially be produced through the pipelines and gas processing facilities developed for the Otway Gas Project.

Increased market demand has also led to a resurgence of investment in the Cooper Basin in central Australia. In May 2011, Santos started a new \$120 million infill drilling program with the aim of increasing gas production at its Moomba gas plant by around 100TJ/d to approximately 400TJ/d.

The Cooper Basin is also thought to contain large reserves of shale gas, potentially greater than all of Australia's known reserves of conventional gas. The US Energy Information Administration (EIA) has estimated the Cooper Basin has risked recoverable shale gas resources of 85tcf gas (EIA 2011). Any shale gas developed in this region has the benefit of being close to existing infrastructure, including gas pipelines to markets.

Beach Energy is leading the Cooper Basin search encouraged by the rapid growth of the US shale gas industry and using subsequent developments in drilling technology. In July 2011, flow testing of the first shale gas well (Holdfast-1) achieved much higher than expected gas flow rates. Beach subsequently booked an initial contingent resource of 2tcf of gas in a restricted area around its first two shale gas wells (Holdfast-1 and Encounter-1).

Also in July, the first major international company to show interest in the Cooper's shale gas potential stepped forward when BG Group formed a joint venture with Drillsearch Energy. BG will take a lead role in a five-year exploration, appraisal and pilot development program over leases held by Drillsearch in the Queensland portion of the Cooper-Eromanga Basin.

A number of other shale gas plays in the Amadeus, Georgina and Beetaloo basins in central Australia have attracted investment by North American companies with shale gas experience (such as Hess Corporation). Shale gas and tight gas fields are also being explored in other regions around the eastern states gas market including parts of Queensland, South Australia and the Gippsland and Otway basins in southeast Australia.

While exploration in all of these regions is still at an early stage, success could again see major changes in the supply side of the eastern states gas market, just as CSG has transformed the market over the past decade.

Western Australia

Western Australia's domestic gas supply capacity is expected to increase by more than 50 per cent by 2015 and with sufficient demand could double by 2020. The following projects have been commissioned during 2011 or are under construction:

- The first stage of the US\$115 million Greater East Spar Project was commissioned in June 2011 when Apache Energy started production from the Halyard gas field. The project has an initial capacity of around 50TJ/d, increasing to 100TJ/d in 2013 when the Spar field is tied in. The capacity of the Varanus Island gas plant has also been increased to 450TJ/d.
- Apache and Santos are about to start production from the Reindeer field and the Devil Creek plant, which is located near Onslow. The A\$1.08 billion project has a production capacity of 220TJ/d.

- In 2013, BHP Billiton and Apache Energy expect to commence gas production from the offshore Macedon field processed through a 200TJ/d gas plant near Onslow.
- In 2015, Chevron is expected to commission a new 150TJ/d gas plant as part of the Gorgon LNG project.

These projects will take WA's gas supply capacity from around 1050TJ/d in 2010 to more than 1600TJ/d in 2016. The development of three new domestic gas plants—in addition to existing facilities on Varanus Island and the Burrup Peninsula and near Dongara—will significantly increase the state's gas supply security.

Beyond 2015, and subject to demand, gas supply capacity could also increase as a result of a planned expansion of the Gorgon domestic gas plant (to 300TJ/d from 2020) and gas supplied from Wheatstone and other new LNG projects. Engineering studies for the Wheatstone LNG project for example, include a domestic gas plant with a capacity of 200TJ/d planned to start production in 2016. The potentially large Zola field discovered by Apache in February 2011 has yet to be appraised but could supply either the WA domestic gas market or an LNG export project.

Exploration for onshore and near-shore conventional gas fields is continuing, including in the Canning Basin where Buru Energy has a partnership with Alcoa. Initial drilling of one accumulation (the Laurel Formation) suggested that it could hold recoverable reserves of several trillion cubic feet of gas and more than 50 million barrels of natural gas liquids. Further drilling is needed to confirm the potential but initial results are promising.

Investment in early stage exploration for unconventional forms of gas is also increasing. AWE, Norwest Energy and Origin Energy are investigating the shale gas potential of the Perth Basin. Early drilling results in one formation (the Carynginia shale) suggest a resource of 13–20tcf of gas in place. Transerv Energy, supported by Alcoa, is continuing to prove up the Warro tight gas field with the aim of producing 100TJ/d from 2012. In WA's southwest, several companies are following up on the Whicher Range gas discovery and assessing other CSG and tight gas prospects.

Shale gas resources in the Canning Basin are being explored by Buru Energy (in partnership with Mitsubishi Corporation) and New Standard Energy. Confidence in the region's prospectivity increased when New Standard Energy announced in July 2011 that it had entered a farm-in agreement with ConocoPhillips, a global oil major experienced in developing shale gas projects in the US and Europe. The US EIA has estimated that the Perth and Canning basins could have risked recoverable shale gas resources of 59 and 229tcf respectively.

Western Australia is therefore well placed to increase gas supply capacity in response to growing gas demand.

Northern Territory

Long-term gas supply security in the Northern Territory improved considerably when the Blacktip project and pipeline to Darwin were commissioned in September 2009. This has led to increased investment in Darwin's power generation and created the opportunity for supplying gas to other parts of the NT economy.

3.3.3 Changing gas markets

The dramatic changes in world energy markets, in particular the shift to gas and increased emphasis on clean energy, are also affecting Australia's gas markets.

These flow-on effects are a natural consequence of Australia's strong links to Asia and the rest of the world through trade and capital markets. Gas suppliers and gas customers alike must adapt to these changes in global and local energy markets.

This is not unique to the energy market. Other commodity markets are also changing rapidly. Steel buyers, for example, are adjusting to higher prices brought about by higher iron ore and coal prices and steel producers are adjusting their product mix to remain competitive.

Increased global gas demand and higher costs will inevitably affect gas prices in Australia. Over recent years the rapid growth of low-cost CSG production, has maintained downward pressure on gas prices in the eastern states market. Prices for conventional gas under existing long-term contracts have averaged \$3.50–4.00/GJ while CSG long-term contract prices have been a little lower, closer to \$3.00/GJ. Spot prices vary considerably according to demand changes and seasonal factors but have generally fluctuated in a range of \$1.50–4.00/GJ.

However, increasing development costs for new Victorian gas projects and growing gas demand are expected to eventually flow through to higher gas prices with prices for new domestic gas contracts in the Kogan Zone in Queensland for example, predicted to increase to \$5.00–8.00/GJ over the next four years (*EnergyQuest 2011b*).

In the West Australian gas market, new contract prices have increased over recent years as a result of the rapid escalation of operating and development costs and the need to source gas from fields further from shore, in deeper water, with higher levels of impurities and with less associated liquids. Average realised prices under current contracts varied between \$1.19 and \$3.84/GJ in the June quarter 2011 while prices for new contracts are reported to be in the range of \$6.00–8.00/GJ.

However, as the marketing for new domestic gas projects moves forward, increasing gas-on-gas competition, as well as competition from diesel and coal, will act to limit gas price rises to levels needed to attract continuing investment.

4 Delivering on high value-adding priorities

This part of the report reviews progress towards implementing options for addressing the strategy's high value-adding priorities.

Each year since the release of *Platform for Prosperity*, the priorities and options have been reviewed and where appropriate, modified in light of changes in the industry and the external environment.

Following several significant changes to priorities introduced in *State of the industry 2010*, this year only the priority relating to fiscal terms has been amended.

It has been broadened to encompass fiscal terms for all petroleum projects (not just gas projects) and

an option added to enable all taxation issues to be considered (not just those related to the company tax system).

Each of the following sections begins by re-stating the objective for that priority followed by the revised options for achieving it.

A brief background section reviews and updates evidence about the importance of the priority and need for change followed by a summary of steps taken so far towards implementing the proposed options. Each section then concludes with thoughts on how the options and priority are likely to move forward in the year ahead.

4.1 Continuously improving safety performance and increasing community awareness of the industry's performance and values

OBJECTIVE

To continuously improve the safety performance of the oil and gas industry and ensure that information on the industry's safety and health experience and performance is accurate and clearly understood by all relevant stakeholders.

KEY OPTIONS

- 1.1 The CEO Safety Leadership Forum established in 2007 demonstrates high level commitment and direction to safety management, continues to assess and implement new opportunities and strategies for improving safety performance and responds to changes in risks and performance (such as the current need for a greater focus on process safety and the integrity of ageing facilities).
- 1.2 Develop multiple levels and forms of data collection and information sharing across the industry including annual safety performance benchmarking, improvements to the APPEA safety alert system and more targeted communication methods.
- 1.3 Work with contractors to ensure that high standards of safety performance and management are maintained across all elements of the workforce, particularly as gas-related construction activity increases to potentially unprecedented levels.

BACKGROUND

While improving, the safety performance of the Australian oil and gas industry still falls short of international best practice. In 2010, the total recordable injury rate in Australia among APPEA member companies was 5.2 injuries per million hours worked, down from 6.0 injuries per million hours worked in 2009. The global average for members of the International Oil and Gas Producers Association (OGP) was 1.68 (Figure 13).

As noted earlier in this report, a major challenge now confronting the Australian (and global) upstream oil and gas industry is to restore community confidence

in the industry's ability to operate safely in sensitive environments. Safety performance and a genuine regard for the health and welfare of its workforce is perhaps the most influential factor affecting community perceptions of the industry and its social licence to operate. Without community support, the growth opportunities available to the industry will be constrained, deferred or even lost forever.

The Australian oil and gas industry has had a strong and proactive commitment to safety for many years. It has sought to develop a safety culture that is led by

senior management and engages every member of the workforce. As indicated in Figure 14, this has delivered a steady improvement in safety performance with lost time injuries per million hours worked declining from 3.5 in 1996 to 0.9 in 2010.

There are two important changes underway in the nature of oil and gas industry activity that present new safety challenges and could adversely affect safety performance. Firstly, the number of onshore drilling contractors has increased rapidly to meet the needs of new CSG-ING projects. Secondly, the industry is experiencing an unprecedented surge in construction activity. Project proponents must work with construction and drilling contractors to ensure they meet the same safety standards and levels of performance as apply to workers in the conventional oil and gas industry. Results to date have been encouraging with the CSG sector reducing the lost time injury frequency rate from 3.5 in the first quarter to 1.8 in the fourth quarter of 2010. While higher than the lost time injury rate for onshore and offshore conventional oil and gas (0.8

and 1.3 respectively for the year), the CSG sector recorded a lower total injury rate. The total recordable injury frequency rate for the CSG sector in 2010 was 6.7 injuries per million hours worked compared to 7.4 for onshore conventional oil and gas and 8.2 for the offshore sector.

Clearly, an ongoing focus on safety is required. The Upstream Oil and Gas Industry Strategy suggests that this could be achieved by:

- maintaining a strong, high-level commitment to identifying and addressing factors that detract from safety performance and by developing and implementing new collaborative safety initiatives (option 1.1)
- ensuring that contractors have the same commitment to performance and improvement and are fully engaged in developing solutions (option 1.3)
- further expanding the repertoire of methods used to collect data and share experiences about safety performance and management (option 1.2).

ACTION TO DATE

The industry's approach to safety management continues to be led by the CEO Safety Leadership Forum established by APPEA in 2007.

Previous strategy reports have outlined the work program of this Forum and several initiatives have now reached fruition. Covering the entire industry including onshore and offshore operations, they include:

- developing systems for collecting, analysing and communicating safety performance data (including details about high potential incidents) to facilitate benchmarking processes and capture critical learnings
- introducing a *Common Safety Training Program* for new entrants to the industry and *Safe Supervisor*

Competence Program that defines competency standards for offshore oil and gas construction supervisors

- holding an annual *Stand Together for Safety* event that facilitates discussions between managers and frontline workers about safety and options for performance improvement. More than 25,000 workers in 75 companies participated in the event during May 2011.

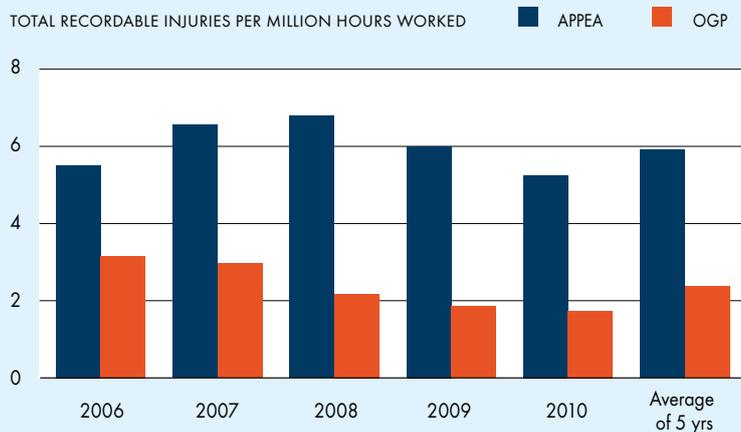
In October 2011, the Leadership Forum endorsed a new safety strategy to deliver a highly targeted program of risk-based projects in process safety, ageing facilities, fatigue management and motor vehicles.

Process safety involves preventing leaks, spills, explosions, corrosion and other equipment malfunctions. It also involves ensuring facilities are designed and engineered properly and systems are in place to control and monitor hazards, people and equipment. Personal safety hazards involve incidents such as slips, trips and falls that usually affect one individual worker. However, process safety hazards (involving the release of potentially dangerous materials or energy) often result in major accidents that can cause multiple injuries and fatalities.

Process safety is a top priority for the industry with companies implementing process safety programs. In 2010, APPEA and the National Offshore Petroleum Safety Authority (NOPSA) held a joint workshop with industry to share and apply systems, experiences and learnings to address process safety across the industry.

A *Sharing Safety Solutions* series of case studies and a DVD on process safety have been developed. The industry is also developing reporting systems around process safety.

Figure 13 International comparison of petroleum industry safety: 2006 to 2010



Sources: APPEA 2011, OGP

Figure 14 Australian upstream oil and gas industry safety performance: 1996 to 2010



As noted in section 2.2.2 above, individual project operators and the industry collectively have also introduced measures for improving well drilling procedures, well integrity and the management of any future oil and gas spills. This work will be continued by a new APPEA Well Integrity and Safety Committee that will access international expertise through a Well Expert Committee recently established by the OGP.

The Australian Government has supported the industry's efforts to apply the lessons learned from the Montara and Macondo incidents and to rebuild public confidence. In August, the government hosted an International Offshore Petroleum Regulators and Operators Summit in Perth. The summit brought together experts and key industry representatives from around

the world, including the United Kingdom and the United States, to compare responses to the Montara and Macondo incidents, discuss reforms and identify common challenges and potential solutions.

Representatives of governments, regulators and the industry agreed upon a *Summit Outcomes Statement* and *Australia's Action Plan*. All parties committed to ongoing implementation of regulatory reforms and improvements to industry practices. APPEA members also signed a *Mutual Aid Memorandum of Understanding* to put in place a framework for deploying and sharing equipment and personnel in responding to significant offshore petroleum incidents.

A leadership group of chief executives from the Queensland CSG industry formed in 2009 has progressed several key initiatives. A contractor safety forum held in May 2011 attracted 300 participants and increased awareness of the tips and tools to implement best practice safety standards. Work on vehicle and bushfire safety and fatigue management has also been completed and a guideline on heavy haulage is being developed. Other initiatives on traffic management (logistics) and mutual aid will progress into 2012 and the focus on contractor safety will be maintained.

Through APPEA, the industry has also initiated studies of its search and rescue capability and of issues and challenges facing service providers, facility operators and regulators in relation to aviation safety. In the first instance, the search and rescue survey was limited to operators of WA and the Northern Territory oil and gas projects. It aimed to identify opportunities for improving search and rescue efficiency and capability through increased cooperation or potential sharing of search and rescue resources.

WAY FORWARD

The industry will continue to pursue avenues for further improving the industry's safety performance and the community's awareness of, and confidence in, the industry's performance and safety values. The main areas of focus will be:

- working with governments, regulators and the international oil and gas industry to further develop and implement measures for improving drilling procedures, well integrity and Australia's oil spill response capability
- developing and implementing measures for addressing the priorities identified by the Oil and Gas CEOs Leadership Forum and the CSG CEOs Forum
- ongoing provision and further development of mechanisms for exchanging information about safety issues, performance and incidents, including networking events and forums specific to individual sectors and important issues
- coordinating key safety initiatives and workshops such as the APPEA National Safety Conference, Contractor Safety Forums and the annual *Stand Together for Safety* event
- strengthening alignment and integration of safety work undertaken by the various industry groups across the whole of the oil and gas sector (including contractors).

4.2 Continuously improving environmental performance and increasing community awareness of the industry's performance and values

OBJECTIVE

To achieve further improvement in environmental performance across the industry, thereby strengthening the ongoing case for regulatory reform and continued access to resources.

KEY OPTIONS

2.1 Develop and implement opportunities for reducing the industry's impact on the environment and improving management processes including:

- further development of the suite of precautions to prevent oil spills and techniques for minimising the consequences of a spill should one occur
- continuing research into the effects of sound exposure on marine mammals and development of management practices for seismic acquisition
- government policies and legislation to enable the CSG industry to effectively manage the production and potential re-use of water in an economically sustainable manner.

2.2 Industry to further develop and implement opportunities for research and information sharing:

- a commitment to environmental research and practices that not simply meet but exceed statutory requirements
- providing mechanisms to ensure that all APPEA members have access to information, resources and environmental innovations to further improve their environmental performance
- fostering an accurate understanding of the industry's real (not perceived) environmental performance through annual collection and reporting of industry environment performance data.

BACKGROUND

Environmental performance, like safety, is an important determinant of the community's perceptions of the upstream oil and gas industry and therefore greatly affects its social licence to operate.

As with safety, a small number of high-profile environmental incidents can quickly destroy the goodwill created from many examples of good performance over a long period of time. It is not just the real incidents such as oil spills that can harm the industry's image. Just the fear of adverse environmental impacts can constrain the industry's social licence to operate and ability to grow.

We have seen this in the growth of community opposition to the CSG industry in Queensland and NSW.

Communities with previously little exposure to the oil and gas industry, and with higher population densities and alternative, long-established land uses, are raising concerns about the potential effects of CSG production and well stimulation practices on water tables, farming land and farming activities. While once specific to Queensland, these concerns are now being expressed in other parts of Australia where the search for CSG and other forms of onshore gas is in its infancy.

Likewise an increasing number of instances of drilling and development activity associated with conventional oil and gas are attracting community opposition. Recent examples include drilling proposals off the Ningaloo

Reef, onshore and offshore southwest WA, offshore from Sydney and parts of the Victorian coast. The development of a gas hub at James Price Point in the Kimberley is also prompting considerable local as well as national debate.

Much of the concern about such activities is the result of a lack of accurate and timely information about industry activities and their environmental impacts.

While essential to gaining community support, impact minimisation alone is not sufficient. It must be accompanied by a heavy investment in environmental research to support an extensive and ongoing program of community consultation and education. The future growth of the oil and gas industry and the achievement of the strategy's targets, depends very much upon every explorer, developer and operator being firmly committed to minimising the impact of their activities on the environment and to timely, comprehensive community engagement. A science-based approach to assessing an activity's potential impact on the environment will also assist regulators and help project proponents gain the approvals needed to undertake activities.

These three themes of taking action to *reduce* environmental impacts, support *research* and *inform* the community and regulators, underpin the above two options for this industry strategy priority.

ACTION TO DATE

Actions to reduce, research and inform are undertaken by individual oil and gas companies and projects and also at national and international industry levels. All projects are subject to comprehensive environmental impact assessment processes and approvals conditions often requiring extensive baseline environmental research, monitoring of performance and impacts, remedial action and offsetting environmental research and management programs.

State of the industry 2010 described two examples of work being done by project proponents to protect the environment (the Gorgon project on Barrow Island) and use environmental resources responsibly (Origin Energy's reverse osmosis water treatment plant). A third example (*Origin Energy – A good neighbour approach to exploration*) is outlined here. There are many more undertaken as part of, or in response to the environmental assessment process, or as part of the commitment by companies and projects to better understand and minimise environmental impacts.

To help improve the dissemination of research results among project proponents and regulators, APPEA has started a multi-million dollar project to compile a new independent, peer reviewed compendium of environmental research relating to impacts from offshore oil and gas activities in Australian waters. This will update the 1994 compendium (*Environmental implications of oil and gas development: The findings of an independent scientific review* also known as *The Blue Book*) and a supplement (*Blue Book 2*) published in 2003.

Blue Book III will consolidate research, facts and data in one place for easy and accessible reference; assess their significance using recognised scientists and experts in environmental impact assessment and ecological research; and identify areas for further environmental research. This will provide ready access to current environmental data; reduce duplication and lower costs for future research and investigation; enhance the industry's reputation by providing credible evidence of the industry's commitment to the environment; and assist regulators.

Environmental information sharing and cooperation among companies will also be assisted by a *Collaborative Environmental Research Initiative* established by APPEA in mid 2011. This aims to fill key environmental knowledge gaps, avoid costly duplication of studies and provide opportunities for companies to undertake collaborative environmental studies that support their current and future business needs.

A working group will assist in the initial development and facilitation of collaborative projects. Several research proposals have already been circulated to APPEA members by the working group, including a proposal to study the impact of modern seismic sources

on various lifecycle stages of the eastern rock lobster, and a proposal to research the migration pathways and critical habitats of humpback and blue whales in Western Australia.

Much is also occurring at the industry level. As noted in section 2.2.2, the industry has introduced a range of measures in response to the Montara and Macondo incidents. These will improve well management practices and the industry's ability to quickly contain oil spills.

The *Joint Industry Programme on E & P Sound and Marine Life* is part way through a four-year, \$10 million research project to study the behavioural response of humpback whales to the sound generated by seismic sources. The study is being undertaken by Australian researchers in partnership with global marine sound and whale experts.

Origin Energy – a good neighbour approach to exploration

The Speculant Three Dimensional (3D) Transition Zone Seismic Survey was acquired by Origin Energy in the Otway Basin, approximately 30km east of Warrnambool, Victoria in late 2010. The survey filled a seismic data gap in shallow coastal zones between existing marine and land 3D seismic surveys.

The survey included part of the Bay of Islands Coastal Park, dairy farms, southern rock lobster fishing grounds and the migration route for the Southern Right Whale. Numerous operational exclusion zones were needed to address stakeholder concerns, avoid environmentally sensitive areas and operate safely in the vicinity of 60 metre sea cliffs and surf.

Initial stakeholder discussions revealed that local residents, media and primary producers did not have a positive view of seismic surveys. However, using the exploration team's good neighbour approach, strong working relationships were built with members of the community, regional experts and other stakeholders. The exploration team overcame these negative views and left some positive impressions for future projects and activities in the region.

To achieve successful environmental and technical outcomes the project required innovative use of modern seismic technology enabling data recording onshore and offshore without a physical connection. On land, a cable free recording system was used for the first time in Australia, avoiding the need for any line preparation or vegetation clearing. Offshore, an ocean bottom cable receiver system was used with a smaller marine source (900 cubic inches) than previously used in the region.

The first field studies for this project started in September 2010 and brought over 50 researchers from all over the world to Peregian Beach in Queensland for six weeks to collect data. The large amount of field work included observation of whale reactions to a seismic airgun, tagging of whales and recordings of whale song. Further experiments using additional airguns and commercial arrays are planned across Australia's east and west coasts over the whale seasons of 2011, 2012 and 2013. The final report is due in December 2014 and adoption of its findings will support the industry's ongoing case for access to marine areas.

The Australian oil and gas industry, through APPEA, is developing a *Code of Practice for the Management of Biofouling* to help vessel and project operators control the spread of invasive marine species. It will build upon the expertise of vessel operators and accommodate the concerns of the fishing industry, provide operational guidance to operators and should lead to the adoption of a more consistent approach by regulators.

One of the ways that the industry seeks to increase understanding about its environmental performance is through engaging with a range of interest groups such as environmental non-government organisations and groups representing the fishing industry. The industry is in discussions with the WA Fishing Industry Council and WA Government for example, about the cumulative impact of resources projects on fisheries. Further studies are being considered. The development of open and effective channels of communication is helping to avoid misunderstandings and enables issues and concerns to be addressed quickly.

As noted in section 2.1.1, the CSG industry is seeking to increase community understanding of its activities and their social and environmental impacts by supporting research, providing factual information, by responding to questions and concerns as quickly and as comprehensively as possible and through an advertising campaign (*We want CSG*). Potential impacts on water tables and water quality have been one of the key concerns. However, an industry-wide review of groundwater monitoring in and around Queensland CSG fields has found no impact on groundwater outside the gas-producing coal seams. At a CSG Water Forum in August 2011, Origin Energy reported that monitoring has been in place for operating gas fields for up to five years in the Surat Basin and almost ten years in the Bowen Basin. No CSG impacts have been found outside the coal measures to date, which is in-line with or better than modelling predictions.

A study released by the University of Southern Queensland in August 2011 showed that the CSG industry will have little impact on either the Great

Artesian Basin or aquifers relied on by agriculture. It also concluded that previous estimates of cumulative water extraction by the industry have significantly overstated the volume of water to be extracted. Since the major CSG projects in Queensland are positioned next to each other, the drawdown of water by one project will also reduce the pressure in adjacent projects thereby reducing their need to extract as much water for gas flow (*USQ 2011*).

Further research into the effects of CSG production on water is being undertaken and water will be one of the key areas to be further studied by the Gas Industry Social and Environmental Research Alliance with the CSIRO.

The Queensland Government's LNG Enforcement Group conducts audits, spot investigations and monitors industry compliance reporting. The unit includes environmental and groundwater experts, who will form part of the team monitoring environmental impacts, groundwater quality and pressures, and will ensure environmental authority conditions are strictly adhered to.

The CSG industry is also seeking to ensure that co-produced water is managed in an environmentally responsible manner and where possible is used beneficially by local industry and agriculture. Water salinity varies across gas fields. Water with relatively low salinity can be used directly for agricultural purposes, as agriculture has done for more than a century. More saline water is reinjected or treated via reverse osmosis and then used in a variety of ways including for agriculture and industrial processing.

Compliance with relevant legislation is the starting point for the industry's approach to managing environmental impacts. In Queensland, baseline monitoring of water bores is a requirement of petroleum tenure holders under the *Water Act 2000*. Operators also have responsibilities under the *Water Supply (Safety and Reliability) Act 2008* to consider impacts on any community's drinking water supply. The Queensland Government requires that CSG wellheads be constructed to relevant Australian or international standards and comply with a Code of Practice on emission detection and reporting. Formal integrity checks must be completed on 20 per cent of all wells every year.

In Western Australia exploration for shale gas and tight gas is increasing and along with it, the need for more information about fracture stimulation's environmental impacts and how these are being managed. In response, the industry has developed and released a *Code of Practice for Hydraulic Fracturing* that defines guidelines and operating practices for the safe and environmentally responsible development of shale and tight gas reservoirs. The industry is also committed to consulting with stakeholders to ensure they have access to credible and reliable information about industry activities.

WAY FORWARD

The “reduce, research and inform” approach must continue to guide the industry, regulators and governments as they work together to improve the industry’s environmental performance and standing in the community. Industry priorities in the coming year and beyond include:

- implementing well integrity and oil spill response measures developed in response to the Montara and Macondo incidents
- supporting local and international research into the impacts of seismic on marine life
- protecting the marine environment through the development and adoption of the *Code of Practice for Management Biofouling*
- resourcing and starting work on the *Blue Book III* compendium of environmental research related to the offshore oil and gas industry
- commencing the *Collaborative Environmental Research Initiative*
- developing better communication processes with the fishing industry to improve interactions and understanding between the two sectors
- addressing community concerns about the unconventional gas industry’s environmental impacts by supporting research, providing accurate and timely information and developing effective channels of communication with key stakeholders.



4.3 An improved framework for exploration

OBJECTIVE

To obtain a comprehensive understanding of Australia's petroleum potential particularly in frontier areas with little or no exploration to date.

KEY OPTIONS

- 3.1 Increase public investment in onshore pre-competitive geoscience initiatives and maintain offshore programs so as to stimulate greater interest in frontier areas.
- 3.2 Develop and implement a package of measures for increasing frontier exploration. Measures could include:
 - improved fiscal terms such as:
 - a 175 per cent company tax deduction for exploration expenses incurred in frontier areas and a broader definition of 'frontier' so as to increase the availability of incentives to a greater number of areas
 - introduction of a system of flow through shares
 - shorter timelines for releasing acreage and other licensing mechanisms that will encourage petroleum exploration in remote and frontier areas
 - improved state and territory incentives for onshore frontier exploration.
- 3.3 Ensure that access is maintained to all exploration opportunities in accordance with principles of balanced multiple and sequential land use by measures that include:
 - streamlined and expedited native title processes
 - development of marine protected areas which minimise cost impacts on the industry and provide for continued exploration and production in prospective petroleum provinces.
- 3.4 Improved coordination of geoscientific data management systems among the various public institutions through the:
 - adoption of common data management standards across all jurisdictions
 - establishment of a single national virtual geoscience library for the management of, and access to, petroleum data in all jurisdictions.

BACKGROUND

Without exploration, petroleum production and the jobs and economic benefits it generates will gradually wither away. Finding new resources to replace depleted fields and support new projects is essential to achieving the industry strategy's liquids and gas production targets and the strategy vision of maximising the value of Australia's petroleum resources. If petroleum exploration had ceased in 1999 Australia's known liquid reserves would have been exhausted by about 2020 and gas reserves would be insufficient to support the many LNG projects now under construction or being considered for development (ACIL Tasman 2010).

Much of Australia's oil and gas exploration activity is occurring around existing and proposed production facilities in proven prospective basins such as the Carnarvon, Gippsland, Cooper and Browse. This means that we continue to see only around 20 per cent of Australia's petroleum basins being covered by petroleum titles. However, it is the other 80 per cent (the frontier basins) that has the greatest potential to contain another major new petroleum production province able to arrest the decline in Australia's liquids production or sustain

this country's position as a leading gas producer. As noted in section 3.1.3, Australia's petroleum trade deficit is growing rapidly. It is not in Australia's best interests to be paying an increasing bill for fuel imports, particularly when so little is known about the nation's petroleum potential.

Maintaining a strong exploration sector and extending its reach to frontier areas is therefore a fundamentally important priority in the industry strategy.

Exploration is also important to the nation economically. The process of exploration itself creates jobs and supports a range of service industries. In addition, developing new discoveries provides a second, much larger and longer-term round of employment and economic benefits (including substantial tax revenues). A modelling study by ACIL Tasman estimated that had all oil and gas exploration in Australia ceased in 2004, the subsequent reductions in petroleum exploration and production activity would take more than \$41 billion from Australia's GDP over the following 20 years (in net present value terms at a 4 per cent real discount rate).

Consumption expenditure would be reduced by \$20 billion over this period and there would be more than 12,600 fewer jobs by 2025 (ACIL Tasman 2010).

To help meet the targeted increases in oil and gas production, *Platform for Prosperity* proposed a set of exploration-related targets. Namely, that by 2017 Australia increases frontier well drilling three-to-four fold, doubles oil reserves, increases gas reserves, discovers at least one new petroleum province and becomes one of the five most attractive locations in the world for oil and gas investment. To date the only objective achieved has been the increase in gas reserves.

As indicated in Figure 15, despite higher world oil and gas prices over recent years, Australia has not been successful at attracting the investment needed to drill more exploration wells. Indeed, the number of exploration wells spudded and metres drilled in 2010 in the search for conventional oil and gas, were the lowest in at least 27 years.

Since 2009 more exploration wells have been drilled offshore than onshore driven by a desire to secure gas reserves for LNG developments and as a result of advances in the understanding and application of hydrocarbon identification techniques. This also reflects the more difficult funding environment faced by small explorers and the increasingly attractive opportunities being taken up by Australia's small to mid-sized petroleum companies in other countries (particularly the US and countries in Asia).

Research undertaken by the Canadian-based Fraser Institute found that international petroleum investors

Lifting the veil on Australia's latest frontier

"It says a lot about the exploration potential of Australia that new onshore basins are still being discovered in the 21st century. Such an event would be unthinkable in the US but in Australia vast frontiers remain untouched, including the newly discovered Millungera basin, east of Mt Isa." (ENP 2011)

The Millungera was discovered as a result of a 2006 collaborative research project between Geoscience Australia, the Geological Survey of Queensland, the Predictive Mineral Discovery Cooperative Research Centre and Zinifex. GSQ subsequently drilled two wells and GA, assisting with the analysis of rock samples and modelling, has found the Millungera to have significant potential for hydrocarbons. Three exploration permits over the Millungera were released by the Queensland Government as part of its petroleum acreage release earlier this year, with bids closing on 14 November.

regard Australia as having more barriers to investment than many other parts of the world. The Institute's 2011 *Global Petroleum Survey* collated responses from 502 senior petroleum industry managers representing 478 companies responsible for more than 60 per cent (US\$300 billion) of global upstream expenditures in 2010. Respondents provided scores against each of 17 factors affecting investment decisions which were then aggregated to form a composite index.

Out of 136 jurisdictions covered by the survey, Australia's eight offshore and onshore jurisdictions ranked between 19th and 45th with four in the top quartile (Victoria, South Australia, Tasmania and the Northern Territory) and four in the second quartile (Western Australia, offshore Australia, Queensland and NSW). The list of destinations considered to have fewer barriers to investment than some Australian jurisdictions is substantial. It includes large parts of North America, New Zealand, Chile, parts of Europe (including the Netherlands, Denmark, Poland and Germany), parts of the Middle East (Qatar, Bahrain and the United Arab Emirates) and the UK (onshore and North Sea).

The factors where Australia ranks most poorly concern access to resources and regulation and approvals processes. While efforts are being made to introduce improvements other countries are not standing idly by but are taking steps to attract the investment needed to develop their petroleum resources. Australia has some way to go to being a top-five destination and even if it should reach that position, it will need to work hard to retain it.

Steps are being taken to increase exploration activity in Australia's frontier petroleum basins, although this has yet to be reflected in well drilling figures. Since 2000 the number of wells drilled in offshore and onshore frontier

Figure 15 Exploration for conventional oil and gas, wells spudded and metres drilled: 1984 to 2010

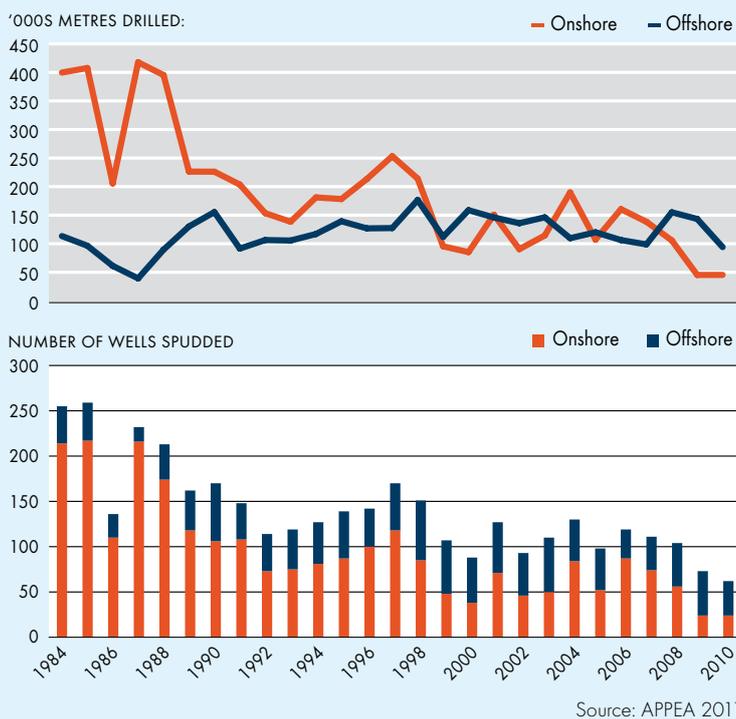
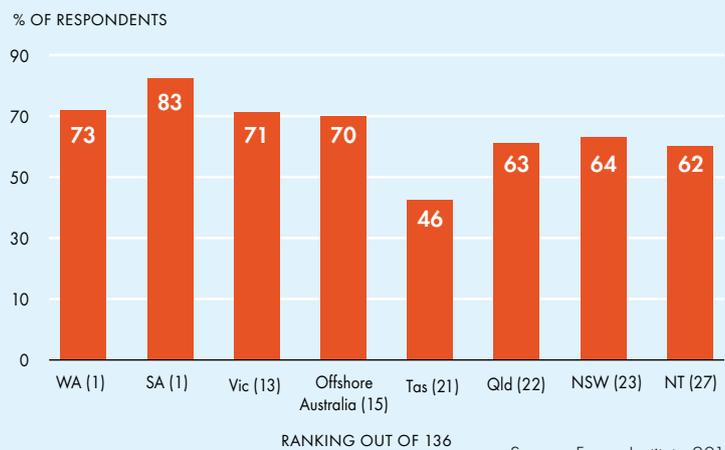


Figure 16 Availability of geological data encourages investment

areas with no hydrocarbon discoveries to date, has averaged fewer than 2 and 3 respectively (*Geoscience Australia*). Two offshore and five onshore frontier wells were drilled in 2010.

The federal government's April 2011 acreage release was targeted specifically at frontier areas in nine basins off the Northern Territory, Western Australia, Victoria and Tasmania. It was the largest acreage release by area in over a decade and the Minister noted:

"...the super-sizing of frontier opportunities acknowledges the challenges of exploring in these areas..."

Australian Government 2011a

Several frontier areas have been taken up in previous acreage releases. The Great Australian Bight, for example, has attracted renewed interest with BP taking up four permits in the Ceduna Sub-basin in early 2011. An Australian subsidiary of Bight Petroleum Corp of Canada acquired two permits in July. Onshore, Buru Energy has started a major exploration campaign in Western Australia's lightly-explored Canning Basin.

Even so, high costs and risks, lack of infrastructure and remoteness from markets make Australian frontier exploration challenging. Other countries have successfully introduced carefully crafted fiscal and regulatory incentives to open up frontier areas and Australia must do likewise if it is to be a serious competitor for internationally mobile exploration capital.

Stagnant levels of exploration activity and Australia's mid-ranking attractiveness for petroleum investment mean that little progress has been made towards doubling the nation's oil reserves or discovering a major new petroleum province.

However, Australia does have one important advantage over many other jurisdictions competing for exploration capital—its investment in pre-competitive geoscience. As indicated in Figure 16, Western Australia is considered by respondents to the 2011 *Global Petroleum Survey* to have the best petroleum database in the world. Other Australian jurisdictions are also rated highly and are in the top quintile on this criterion. Between 62 and 83 per cent

of respondents felt that the availability of geoscientific data encourages investment in Australia's mainland and offshore jurisdictions.

As stated by the Minister for Resources and Energy in April 2011, the returns from this public investment are very high so it is in Australia's best interests to see this effort at least maintained and preferably enhanced. In comparing Australia's investment in government geoscience with that of other countries, ACIL Tasman found that:

"...a number of countries with significant petroleum and minerals industries have established geological surveys with budgets that are comparable to or exceed the collective expenditures by GA and the state and territory geological surveys."

Access to acreage in an efficient and timely manner is also an important consideration for explorers choosing between investment destinations. In some onshore jurisdictions, lengthy and uncertain timelines involved in native title processes add unnecessarily to costs and delays in exploration activity. In offshore areas, the industry is working with governments and other stakeholders to develop a representative system of marine protected areas. The industry supports a multiple-use management approach and has played an active and constructive role in adding a further 13 marine parks, with an area around three times the size of Tasmania, in Australia's southeast oceans. This contribution must continue as marine plans are developed in other parts of Australia's offshore waters.

Great Australian Bight—new pre-competitive data changes perceptions of prospectivity

In 2007, Geoscience Australia undertook a marine sampling survey of rocks on the seabed of the Great Australian Bight. Geochemical analyses characterised these samples as world-class, oil-prone, marine potential source rocks. These source rocks can be seismically mapped throughout most of the Bight Basin and modelling has shown they are mature for oil and gas generation across much of the Ceduna Sub-basin. These organic-rich rocks had not been sampled previously, and their identification changed perceptions about the source rock potential of the Bight Basin.

The discovery of a new source rock was actively promoted to Australian and international companies and attracted considerable interest across a wide spectrum of the exploration industry. In 2009, the Australian Government released six large deepwater exploration areas in the Bight Basin, which further encouraged the speculative acquisition of multi-client seismic and airborne magnetic surveys by the exploration industry. In 2011, four exploration permits were granted to BP Australia, with a guaranteed \$600 million three-year work program which will include four wells. The company has also committed to a secondary work program in excess of \$800 million during the subsequent three years.

GA 2011

ACTION TO DATE

Pre-competitive geoscience OPTION 3.1

In May 2011, the Department of Finance and Regulation released a *Strategic Review of Geoscience Australia* (Commonwealth of Australia 2011). The review found that:

"GA's main activities are underpinned by a sound business case in terms of servicing government policies and the government's interests in facilitating development of community owned resources" and that GA information products "have strong 'public good' attributes in terms of being products that, once created, may be accessed by any user without diminishing their availability to other users (non-rivalry in consumption) and for which any restriction on access either creates unacceptable efficiency or welfare losses or is not practical."

Economic modelling undertaken for the review suggested that:

- a one-off \$1 million increase in GA expenditure on pre-competitive geoscience is associated with a short-run increase in private offshore exploration expenditure of \$31 million (in 2009-10 dollars) with a three year lag
- a \$1 million year-on-year increase in private petroleum exploration expenditure is associated with a contemporaneous \$1.6 million year-on-year increase in the value of offshore petroleum production (in 2009-10 dollars).

The review also pointed to previous studies undertaken by the Productivity Commission and the Australian Bureau of Agricultural and Resource Economics that found geoscience data is a public good and government investment in geoscience data collection delivers substantial economic benefits.

The Policy Transition Group (PTG) advising the government on implementing changes to resources taxation announced in July 2010 also noted the importance of GA and the state and territory geological surveys to maintaining a healthy commercially-based exploration effort. It also acknowledged GA's importance as a national repository for publicly and privately acquired geoscience information (*Australian Government 2010b*).

The PTG recommended that the Australian Government provide a more sustainable stream of funding for GA to acquire and manage geoscience data. Funding options and other matters recommended by the Strategic Review of GA are being further considered by government assisted by an industry/government steering committee. The industry agrees it is necessary to provide GA with more sustainable, long-term funding arrangements. It is also important to recognise the public good benefits resulting from GA's work, including the assistance provided to governments in making informed policy decisions and in administering the acreage

For the period June 2006 to June 2011

the return on the government's investment of \$75 million for work under Geoscience

Australia's Offshore Energy Security Program is

\$625 million in committed frontier exploration

expenditure in acreage released in the frontier

areas of the offshore Bremer, Bight, Arafua and

Canning basins, with a proposed secondary

program of an additional \$1 billion. That is a

return on investment of 833% for committed

exploration expenditure which rises to a

staggering cumulative investment return

of 2166% if you take into consideration

secondary programs.

The Hon. Martin Ferguson AM MP,
Minister for Resources and Energy
Australian Government 2011a

release program, as well as the tax receipts received by governments from successful exploration activity. As noted by Minister Ferguson, governments already receive a high rate of return from their investment in geoscience.

Geoscience data management OPTION 3.4

The national virtual geoscience library and virtual data room became operational in late 2010. However, issues relating to data standards and consequent data harvesting have been challenging. Moreover, an organisation-wide initiative to improve all product delivery has meant that the virtual data room and concept has been suspended.

The new Geoscience Australia data delivery system will be used for petroleum information and petroleum data is still readily available from GA through its online services. Current developments within GA focus on geoscience data management methodologies, along with its data repository, and data delivery using web service technologies. Web services make data transfer easy and instant and remove the need for resource-intensive physical data transfers.

The development of common data management standards across all jurisdictions is progressing but more slowly than anticipated.

Increasing frontier exploration OPTION 3.2

In response to certain recommendations from the *Strategic Review of Geoscience Australia*, the government has established a *Review of Australia's Offshore Petroleum Exploration Policy*. This is to examine the effectiveness of Australia's current acreage release model (work program bidding) in meeting the government's offshore petroleum exploration policy objectives and to identify and assess possible alternative models. This could lead to changes in the way that exploration titles are defined and awarded and the nature and extent of geoscience data provision. The need to attract increased exploration in frontier and remote basins should be an important consideration in the exploration review. Possible changes to the licensing system to achieve this have been under discussion for several years.

An effective fiscal measure is needed to attract investors to Australia's frontier areas. This type of exploration faces particularly high costs and risks and is often remote from infrastructure and markets. High costs and Australia's already large gas reserves base mean that oil is often the primary target. However, with few major oil discoveries over the past decade, Australia is considered to have low oil prospectivity.

Therefore, an exploration program in one of Australia's frontier areas typically carries higher than average risks with lower than average returns, when compared to many other countries. Public investment in frontier geoscience helps reduce the risk and the after-tax returns can be increased by offering more attractive tax terms such as a higher company tax deduction for exploration costs.

In response to recommendations from the PTG, the government decided to not proceed with earlier commitments to introduce a flow-through share scheme or exploration tax credit for small explorers. This is to be reviewed in 2015 but in the meantime small explorers will continue to be disadvantaged and discouraged from pursuing exploration opportunities that cannot be commercialised quickly.

Over recent years several state governments have introduced policies and programs to support onshore petroleum exploration and development. NSW has an incentive model that includes a five-year royalty holiday and the *Target Exploration Initiative in South Australia (TEISA 2020)* has been extended.

The Western Australian budget for 2011 - 12 provided funding of up to \$20.6 million over three years for the *Regional Alternative Energy Mobilisation Project*, an extension of the \$80 million *Exploration Incentive Scheme* that commenced in 2008-09. The additional funding will be focused on developing higher-risk, onshore unconventional energy resources including shale gas, tight gas and geothermal energy by encouraging the mobilisation and availability of drilling and fracturing

equipment in Western Australia. The state government has also sought to improve the risk/return balance for this type of frontier exploration by introducing a lower royalty rate of 5 per cent for tight gas.

Access to resources OPTION 3.3

Administration of the Native Title regime around the country and negotiation processes with native title claimants are, in most cases, gradually improving. Jurisdictions such as South Australia, Western Australia and Victoria have moved towards frameworks based on land-use agreements that are helping to expedite native title claims and access to land for exploration.

In May 2011, the Australian Government released a draft bioregional marine plan (BMP) for the southwest region—an area that spans all Commonwealth waters from Kangaroo Island to Shark Bay. The BMP includes a draft network of Marine Protected Areas (MPAs) and a marine National Park Zone that excludes all commercial activities and recreational fishing. The government has stated that it recognises the importance of energy security and as a consequence has excluded areas of medium and high prospectivity in marine national park zonings. Most prospective regions in the MPA network are categorised as multiple-use zones.

While the zonings have attracted most attention, compliance requirements under the BMP might have a greater impact on approvals processes and the industry's day-to-day operations. Approvals should be expedited if project proponents address regional priorities in their environmental referral documents.

The Southwest BMP is expected to be finalised in late 2011. Meanwhile bioregional marine plans for the north and northwest regions were released for comment in August 2011. As with the southwest BMP, the industry is seeking to ensure that all current petroleum industry operations and areas that are prospective for petroleum are defined as multiple-use zones.

The oil and gas industry has welcomed two government reviews aimed at improving the security of Australia's offshore petroleum exploration and production infrastructure. On 1 February 2011, the Australian Government initiated an inquiry into the security of Australia's offshore oil and gas sector and on 22 June 2011, the Minister for Defence initiated an Australian Defence Force Posture Review.

The first of these will assess the quality and effectiveness of current security arrangements as well as the ability of resource operators and government to respond effectively to security incidents or attacks on offshore oil and gas exploration and production infrastructure. It will also identify any security gaps and weaknesses and areas for improvements. The inquiry is being conducted by the Inspector of Security, Mr Mick Palmer AO. A draft report to be provided by the end of 2011.

The Defence Force Posture Review will assess whether the Australian Defence Force is best positioned to meet Australia's current and future strategic challenges. This could result in an increased defence force presence in northwest Australia to provide greater security for the large investments in oil and gas infrastructure and other resources projects. The review is being undertaken by Dr Allan Hawke AC and Mr Ric Smith and is to provide a progress report by the end of 2011 and a final report in early 2012.

The Queensland and NSW Governments have been reviewing and modifying access and regulatory regimes in response to the CSG industry's rapid growth. Queensland introduced a land access code of conduct in 2010 to clarify processes for negotiating access to land and a *Strategic Cropping Land* policy to ensure that development does not lead to permanent alienation or diminished productivity of such land. New land

access laws, including a new *Land Access Code* and a *Standard Conduct and Compensation Agreement*, give landholders greater protection and security in their dealings with resource companies. The government is also considering proposed changes to the titles system in cases where petroleum, mining and carbon capture and sequestration titles overlap.

The NSW Government is also working on a strategic cropping land policy and codes of practice governing CSG operations.

It is important to recognise that CSG wells have a limited lifespan and do not permanently alienate or devalue the land on which they are based. Ground disturbance during the drilling and operating phase is minimal and CSG activities are subject to extensive environmental approvals processes and environmental conditions. CSG operations can co-exist with other land-use activities.

WAY FORWARD

Priorities for the coming year will include:

- ensuring that the *Review of Australia's Offshore Petroleum Exploration Policy* delivers genuine improvements to acreage management processes that make offshore exploration more attractive (particularly in frontier areas) and secures long-term government funding commitments for GA in recognition of the 'public good' nature of its research
- continuing to promote the need for improved fiscal terms for frontier exploration through policy processes such as tax reform and development of the national Energy White Paper
- helping the West Australian Government implement the *Regional Alternative Energy Mobilisation Project* to ensure that the government and project proponents gain maximum value for the public and private funds invested
- contributing to the finalisation of the southwest BMP and development of the north and northwest plans to ensure that the petroleum industry's ability to operate in sensitive areas is recognised and access to prospective areas is maintained
- ensuring that further development of land access, regulatory regimes and codes of practice governing unconventional gas operations helps to ameliorate community concerns and facilitate the industry's growth.

4.4 More consistent and more efficient approvals and regulatory regime for petroleum exploration, development and operations

OBJECTIVE

To reform numerous aspects of the approvals and regulatory framework to:

- enhance Australia's international competitiveness for petroleum exploration and development
- provide shorter and predictable approval times
- be transparent and have objectives-based processes
- ensure uniformity across jurisdictions
- eliminate duplication.

KEY OPTIONS

4.1 In consultation with industry, jurisdictions should consider and implement recommendations from the Productivity Commission's *Review of the Regulatory Burden on the Upstream Petroleum (Oil and Gas) Sector*. Changes should aim to achieve a more efficient, consistent, whole-of-government, cross-jurisdictional approach to approvals processes, regulation and policy development for the Australian oil and gas industry with:

- guidelines and rules for assessment agreed nationally and jurisdiction-specific requirements based on agreed guidelines
- the early engagement of all stakeholders and development of policies and regulations based on a robust risk assessment of industry activities and the best available science (an extension of the model of the Environment Assessors Forum to other forms of regulation should be considered)
- further consideration of options for the regulatory structure, including a national offshore petroleum regulator as recommended by the Productivity Commission.

Quickly implement those changes which could deliver real and tangible improvements to the regulatory framework, including:

- establishing a lead agency for petroleum approvals in each state and territory
- simplifying and streamlining regulations under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
- adoption by all jurisdictions of major project facilitation and expedited approvals processes for projects of state and national significance
- streamlining environmental approvals with day to day regulation delegated to designated authorities
- enhancing the role and effectiveness of the Environmental Assessors Forum
- introducing transparent policy principles for environmental offsets
- harmonisation of safety regulation and standards and their interpretation across states and territories.

4.2 In consultation with industry, the Australian, state and territory governments implement recommendations from other reviews of legislation, regulation and approvals processes applying to the petroleum or resources industries.

BACKGROUND

Improving regulatory efficiency could deliver major cost savings to governments and the industry, reduce project risk and significantly increase Australia's attractiveness for oil and gas investment. Regulatory inefficiency has a cost (or value leakage) that reduces returns to investors and the community from resources development. These include tax revenues to governments, employment, investment in infrastructure and the purchase of local goods and services. Industry can to a point absorb these costs while markets are buoyant but projects will be deferred or lost when conditions are less favourable. In 2009, the PC estimated that regulatory reform could

add billions of dollars to the present value of petroleum resource extraction in Australia.

These benefits can be obtained without compromising standards of safety, environmental protection and resource management that regulators and the community demand. The types of regulatory reform proposed by the oil and gas industry aim to improve process efficiency, not reduce or weaken safety and environmental outcomes.

The Fraser Institute's *2011 Global Petroleum Survey* referred to earlier (section 4.3) produced some disturbing results concerning global investors' perceptions of

Australia's regulatory performance. The 502 respondents considered Australia's offshore and seven onshore jurisdictions generally ranked poorly in regard to four factors concerning approvals and regulation. These were 'costs of regulatory compliance', 'environmental regulation', 'uncertainty concerning protected areas' and 'disputed land claims'. Western Australia, South Australia and the Northern Territory were considered to be in the top quartile of world performance for costs of regulatory compliance but in most of the other 29 jurisdiction/factor combinations, performance was considered to be little better than average. In more than 50 per cent of cases, Australian jurisdictions were considered to be in the bottom half of world performance in regard to these four factors.

Survey results such as these should be ringing alarm bells in the Australian oil and gas industry and in governments and regulators. Australia is currently experiencing a surge in gas-related development and exploration for gas around known petroleum provinces. However, much more investment needs to be attracted to the much larger part of Australia that is yet to be seriously assessed for petroleum resources. There is also an urgent need to address Australia's declining oil production. Hence there are no grounds for complacency. More must be done to improve Australia's petroleum approvals and regulatory processes if the strategy objectives of maximising value and delivering energy security and sustainability are to be achieved.

ACTION TO DATE

Productivity Commission review and Montara report

The PC's *Review of the Regulatory Burden on the Upstream Petroleum (Oil and Gas) Sector* was released in April 2009 and the Montara Commission of Inquiry report was released in November 2010. The government's final response to both reports was released on 25 May 2011.

The PC's recommendations were wide ranging, proposing measures for improving the efficiency, consistency and transparency of approvals processes and assessment practices and regulatory reform of Australia's offshore petroleum industry. In December 2009, the Ministerial Council on Mineral and Petroleum Resources (MCMPR) agreed on responses and implementation plans to 25 of the PC's 30 recommendations. Implementation of these 25 agreed actions is now underway. Consideration of the five remaining recommendations relating primarily to institutional reform was deferred until the outcomes of the Montara Commission of Inquiry were known.

The Montara Commission of Inquiry report contained 100 findings and 105 recommendations addressing:

- the likely causes of the incident
- the regulatory regime's adequacy and effectiveness for offshore petroleum (including safety and environmental management)
- the level of compliance with legislative obligations
- adequacy of the incident response by governments and the offshore petroleum industry
- the environmental impacts of the incident.

In regard to the regulatory regime, the report particularly highlighted disconnects and duplication in the existing system relating to safety, integrity, environment and reservoir management. These findings, together with the PC recommendations for institutional reform, led the government to move to establish a single offshore regulator for Commonwealth waters (the National Offshore Petroleum Safety and Environmental

Management Authority, NOPSEMA) and a single titles management agency (the National Offshore Petroleum Titles Administrator, NOPTA).

Legislation to implement these changes was passed by the Australian Parliament on 14 September 2011. It expands the functions of the National Offshore Petroleum Safety Authority (NOPSA) to become the regulator of occupational health and safety, integrity of facilities and wells, environmental management and day-to-day operations relating to petroleum activities in Commonwealth waters.

The legislation also creates the NOPTA to administer titles and data and imposes cost-recovery levies on the industry. The two new agencies are to start operating on 1 January 2012.

In working with governments to implement these reforms, the oil and gas industry has sought to ensure that the new regulatory agencies have the competence and capacity to provide robust and professional oversight of the offshore industry, deliver greater regulatory efficiency, remove duplication in and between the Commonwealth and the states and Northern Territory, and are subject to appropriate accountability and governance arrangements. It has also sought to ensure that legitimate concerns of the states are addressed and ongoing onshore regulatory issues are not neglected.

The government is also responding to other key recommendations from the Montara report including:

- reviewing all Commonwealth legislation applicable to the marine environment to identify any gaps or outstanding issues in the regulation of offshore activities
- comprehensively assessing and strengthening the current government/industry framework governing preparedness and response to marine pollution incidents (being undertaken by the Australian Maritime Safety Authority)
- enhancing environmental assessment processes under the *Environment Protection and Biodiversity and Conservation (EPBC) Act 1999*.

Review of the EPBC Act

Less progress has been achieved in reforming environmental regulation covered by the EPBC Act. A review of the Act undertaken by Dr Allan Hawke AC during 2008–09 and released by the government in December 2009 concluded that the legislation needed a major overhaul and modernisation. The oil and gas industry has pointed to the need for reforms that reduce uncertainty and complexity, streamline processes and avoid duplicating other federal and state regulatory arrangements. In particular, establishing NOPSEMA provides the opportunity to ensure world-class, highly experienced regulators oversee all critical elements of the industry's environmental management and operations. This would improve regulatory efficiency and address a key finding of the Montara Commission. It could be achieved by an appropriate accreditation of NOPSEMA under current provisions in the EPBC Act.

The industry is also seeking a national approach, agreed by the Commonwealth, State and Northern Territory Governments, to the use of conditions on environment approvals requiring environmental impacts to be offset by other measures to protect or benefit the environment.

Use of environmental offsets has increased over recent years and there is a lack of clarity and consistency among government policies as to when these are required and how they should be determined. It needs to be recognised that every environmental offset comes at the expense of an economic or social benefit that would otherwise have been generated by the project. Each demand for multi-million dollar environmental offsets, while benefitting an environmental value, results in a cost and value leakage that reduces the project's tax and royalty payments and ability to fund other potentially higher-valued social and environmental programs. Without any form of cost/benefit analysis, an environmental program of potentially low environmental value could be prioritised over hospital beds, teachers or other social services that the industry's taxation and royalty payments would otherwise have gone towards.

Offshore operators have recently faced increasing difficulty in securing EPBC Act approvals for seismic surveys and exploration drilling programs. New conditions, quite different to the precedents that have evolved over the past decade, are being imposed that adopt a highly precautionary approach that is disproportionate to the environmental risks posed by these activities. The Commonwealth environment department has responded by developing two guidance documents on drilling (including spills) and seismic. As noted in section 4.2, the oil and gas industry has long been a major sponsor of marine science research including studies on the effects of seismic on marine life. Conditions on approvals, restrictions on offshore activity and 'guidelines' on conducting such activity, should be science based and not impose costs for little or no environmental benefit.

On 24 August 2011, the government's released its response to the review of the EPBC Act as part of a broad package of reforms for Australia's national environment law. The reforms outline a suite of changes to the EPBC Act many of which are supported by the oil and gas industry. Proposed reforms include:

- a focus on whole regions and ecosystems and faster environmental assessments
- plans for accreditation between the commonwealth and the states
- cost recovery for decisions under the EPBC Act
- changes to administrative processes to reduce red tape
- a commitment to provide better upfront guidance on legislation requirements, with more long-term certainty and transparency.

Streamlined petroleum regulations

A four-year project to consolidate and streamline regulations under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* was completed in April 2011 when the third and final set of regulations (on resource management) took effect. The revised regulations were developed in consultation with industry and have removed areas of duplication, streamlined processes and reduced the compliance burden on the industry and regulators.

Model Work Health and Safety Act

In December 2009, the Commonwealth, state and territory governments agreed to adopt a standard approach to work health and safety laws to improve productivity and consistency. A model *Work Health and Safety (WHS) Act* was endorsed, with the intention that it and associated regulations and codes of practice commence operation in January 2012. Mirror legislation would then be enacted in each state and territory.

The Australian oil and gas industry supports the objectives of a harmonised approach to occupational health and safety legislation. However, it wants to ensure that the safety case approach to safety management in the offshore industry is not compromised as it is a higher-level system of regulation than the general occupational health and safety regimes now in place across Australia. The onshore petroleum industry also wants to ensure that the reforms integrate well with the labyrinth of state-based Acts and regulations that will continue to operate and hence do actually reduce administrative complexity and overlap. The model regulations as presently drafted raise a number of concerns about their relationship with existing state and territory hazard-specific legislation and could lead to increased levels of prescription and administration. The potential costs of regulatory change to industry and governments could also be significant. These and the transitional arrangements need to be better defined.

Approvals reform in Western Australia

Reviews of approvals processes and regulation governing the resources industry undertaken during 2008 and 2009 led to several process reforms and changes to administrative arrangements.

A lead agency framework for major projects has been established with the Department of Mines and Petroleum (DMP) responsible for coordinating all approvals for the resources sector.

The department has commenced an Approvals Tracking Project that comprises a number of measures to help streamline the resources approvals process.

These measures include online systems such as the *Environmental Assessment and Regulatory System* (EARS) and the *Petroleum and Geothermal Register* (PGR), together with quarterly reporting of key performance indicators.

As a part of EARS for example, Program of Works applications for environmental assessment can be lodged and tracked online. The PGR is being upgraded to support the online lodgement and processing of acreage releases, permit bids, drilling applications and other regulatory functions. Introducing these systems has reduced application and processing times and allowed companies to track progress on their applications.

The regulatory regime applying to shale and tight gas production is currently being reviewed by DMP. A reform package and other measures for improving transparency and regulatory oversight are expected to be introduced over the next year.

DMP is also working with other agencies to progress reforms in other approvals such as native title, environment and Aboriginal heritage.

The WA Government has also created an independent Office of the Environmental Protection Authority (EPA) and some improvements have been made to environmental impact assessment processes.

Approvals for land clearing have been a source of frustration for many years. Changes are being discussed that would streamline the process and reduce timelines but progress to date has been limited.

Approvals reform in Queensland

Queensland has also completed several reforms of approvals processes and regulation of relevance to the oil and gas industry over recent years.

A working party formed to consider an internal government report, *Streamlining Approvals Project—Mining and Petroleum Tenures Approval Process*, recommended a range of changes to make the state's approvals processes more efficient.

The Department of Environment and Resource Management is progressing an initiative to identify and implement measures that streamline and reduce the burden of environmental regulation on business.

The oil and gas industry is represented on the Business Advisory Group. Somewhat paradoxically, the industry is in discussions with the department about a draft *Biodiversity Offsets Policy* to be applied in addition to existing requirements for matters of national and regional environmental significance.

WAY FORWARD

Good starts have been made on several fronts but much remains to be done to complete the reform processes that have been initiated and to develop new ones to lift performance in those remaining areas where it is still lagging.

Priorities in the year ahead will include:

- establishing the new offshore regulatory agencies and the development of workable transition arrangements and new lines of communication and cooperation
- implementing other approvals and regulatory reforms recommended by the PC and Montara Commission and agreed by government
- improving the operation of the EPBC Act by streamlining processes and reducing uncertainty
- other improvements to environmental assessment processes, including accrediting NOPSEMA processes under the EPBC Act, providing greater clarity on the use of environmental offsets when setting conditions, and using a science-based approach to environmental assessments of drilling and seismic activities
- providing input as required into the further development of model WHS legislation and regulations to ensure that these do not adversely affect onshore oil and gas operations and that they successfully promote improved safety performance while also reducing administrative complexity
- further implementation of approvals and regulation reform in Western Australia and in Queensland. Implementing the new offshore regulatory arrangements provides an opportunity to review progress to date and to move ahead with outstanding reform priorities for improving state, territory and commonwealth regulation and approvals processes.

4.5 An improved fiscal framework for oil and gas projects

OBJECTIVE

To improve the international competitiveness of Australia's fiscal regime for oil and gas projects.

KEY OPTIONS

- 5.1 Implement key adjustments to the company tax regime to reduce the distortionary impact of income tax on the economics of gas projects. Under the existing provisions, gas developments generally incur a tax liability prior to generating a risk-adjusted return on invested funds. Reform could be achieved through the application of a five-year write-off under the depreciation regime. Such a reform would also have the opportunity of achieving significant greenhouse-related benefits by encouraging the development of a suite of new gas-based projects (for both domestic and export markets).
- 5.2 Ensure that proposed changes to other elements of the taxation regime including resource taxes, do not discourage or distort investment decisions, are transparent and administratively efficient and enhance Australia's international competitiveness for oil and gas industry investment.

BACKGROUND

Prospectivity and the share of production or profits taken by governments are often cited by international oil and gas companies as being the two most important factors affecting investment location choices around the world. As indicated in Figure 7, around half of the industry's pre-tax profits are paid to governments. Oil and gas producers are subject to company tax and the full range of other state and federal government taxes applying to business generally, as well as to production royalties and/or resources taxes. These provide a return to the community for the depletion of its natural resources (resource taxes) and business activity (income taxes and other charges).

Tax systems and settings that are not administratively efficient and internationally competitive can have a significant impact on project economics and investment decisions. Any such deficiencies must be addressed if the strategy's oil and gas production targets are to be achieved.

Option 5.1 has not changed since *Platform for Prosperity* was released in 2007. Australian gas projects still face a significant competitive disadvantage. Such projects are generally very capital intensive (Gorgon has a capital cost of \$43 billion for example) and it is many years before the return on capital turns positive.

Under Australia's current company tax rules, the average period over which much of the capital invested in gas projects may be deducted or written off is between 15 and 20 years. This is much longer than the three-to-ten year write-off periods available to gas projects overseas that compete with Australian projects for investment capital and gas customers.

The depreciation rules also create a bias in the tax system against investment in capital intensive industries like oil and gas. Other parts of the economy, such as the finance

and services sectors, can deduct most of their expenses either immediately or over just a few years.

The company tax depreciation regime applying to the Australian oil and gas industry is arguably distorting investment decisions and making it harder for Australian gas projects to be internationally competitive. It requires further review.

Other elements of Australia's taxation regime can also either enhance or detract from Australia's competitiveness for oil and gas investment. Resource taxes in the form of excise and royalties on production and taxes on profits can, in some cases, have as large an impact on project economics as company tax. It is just as important, therefore, that these taxes do not undermine competitiveness and operate in a transparent and administratively efficient manner.

The production-based taxes of excise on oil and condensate production (levied by the Commonwealth) and royalties on all petroleum production (levied by the Commonwealth, states and Northern Territory) could deter investment in marginal projects or result in the premature cessation of production at the end of project lives. The PRRT applied to offshore areas avoids this problem but extending it to onshore operations while still retaining excise and royalties on production does not. PRRT is more complex and costly to administer. Unresolved issues around the scope of deductible expenditure, the definition of exploration and the nature of excluded expenditure must be addressed. Administration of the tax must also be improved and compliance costs reduced. Simply applying the current PRRT uncertainties to onshore projects is not sustainable. Recent litigation has also created uncertainty around interpretation of some aspects of the regime. Industry is committed to working with the government to address these concerns.

Levying taxes on business inputs to production also reduces the efficiency of Australia's tax system and industry competitiveness. Introducing the GST and removing the wholesale sales tax has been a valuable reform. However, from time to time, issues arise in relation to administering this and other elements of the tax system

in ways that increase business costs. These include the system for providing rebates of fuel excise, a situation that is likely to become considerably more complex (and costly) with the fuel excise reforms that are scheduled to apply from 1 December 2011 and 1 July 2012.

ACTION TO DATE

Company tax terms

Little progress has been achieved towards improving the company tax terms, particularly as they apply to the capital costs incurred by gas projects. The industry has continued to highlight the competitive disadvantage this creates for Australian projects and the way it magnifies the cost disadvantages that Australian LNG projects already face.

Despite pre-election commitments to review the terms applying to gas projects and energy-intensive processing industries, neither the National Review of Taxation nor, to date, the government's response, have acknowledged the need for reform or established a process whereby reform could be further considered. The government has, however, indicated that it will pursue a reduction in the baseline company tax rate to 29 per cent from 2013-14.

Petroleum Resource Rent Tax

In July 2010, the government announced that the PRRT will, from 1 July 2012, be applied onshore and to the North West Shelf Project. A Policy Transition Group (PTG) of government and non-government representatives was formed to advise the government on extending the PRRT and the concurrent decision to introduce a Mineral Resource Rent Tax (MRRT) on the coal and iron ore industries. The PTG reported to the government in December 2010 and the government announced its response to the PTG report in March 2011, accepting all of the recommendations concerning the PRRT.

A decision on the advice to the government in relation to improving the operation of PRRT was deferred for revenue reasons. A Resource Taxation Implementation Group and a National Tax Liaison Group Resource Rent Tax Subcommittee were then formed to consult further with industry about the implementation of these tax changes. Industry has been represented on both these groups. Legislation to extend the PRRT is now before parliament. The government has indicated it intends to provide early guidance to help companies transition into the new provisions.

The impact of extending the PRRT to onshore petroleum activities should not be underestimated. Unlike the offshore areas, PRRT will apply in addition to state and territory royalties, creating another layer of administration costs for taxpayers and tax collectors.

The onshore industry is very different to the offshore industry in that it is made up of a much larger number of licence areas and apart from the CSG-LNG sector, a larger number of much smaller projects and companies. All companies with onshore interests regardless of their size and extent of onshore activity, will need to introduce new tax accounting systems and comply with complex and costly compliance obligations even though many may not incur a tax liability.

The onshore industry is also more diverse in terms of the petroleum products being explored for and produced. In particular, the search for and development of unconventional forms of oil and gas (CSG, shale oil and gas and tight gas), is at different stages of development in different parts of the country. The CSG industry is well established in Queensland and NSW but is only just beginning to be assessed elsewhere.

Companies looking to find and develop shale gas and tight gas resources are still at the early stage of determining the applicability of overseas-sourced technology to local conditions and initial resource assessment. PRRT must be applied to unconventional petroleum in a way that reflects these activities' different operational, commercial and risk structures. Differences in environmental impacts and activities and contributions to local infrastructure must also be recognised and accounted for in project expenses. The opportunity for these new sources of petroleum to grow must not be lost or constrained due to inappropriate or poorly administered fiscal settings.

It will also be important to ensure that transitional arrangements for current projects do not create a retrospective form of double taxation. Valuation methods for example, for determining starting base values must be consistent with industry practice. The starting base values should reflect the different corporate and project structures, be fully deductible and subject to existing augmentation principles.

With many more companies being subject to the PRRT, including many smaller companies with limited resources, the outstanding technical issues related to the operation of the PRRT should be quickly resolved. A review of the ATO's administration of the tax would help to improve its compliance with the government's stated policies and objectives.

Fuel taxation and credits

The *Clean Energy Future* package of legislation recently passed by parliament includes a reduction in the fuel tax credit for off-road business activities of 6.2 cents a litre from 1 July 2012, indexed annually thereafter. If implemented, this will increase fuel costs for the upstream oil and gas industry by an estimated \$30-50 million year on a business-as-usual basis, and by even more if current high levels of construction activity in the sector are taken into account.

A universal increase in the price of diesel across all consumers could be justified as a greenhouse gas abatement measure in much the same way as the carbon tax is to apply to all electricity generation.

However, its selective application to limited activities really makes it a tax on targeted key business sectors. Taxes on business inputs are widely acknowledged to be an inefficient form of taxation.

WAY FORWARD

The main focus of attention over the remainder of 2011 and during 2012 will be on the extension of the PRRT to onshore petroleum activities and the North West Shelf Project. Despite the operation of the PRRT for more than 20 years, this is not a simple, low-cost exercise (for either taxpayers or tax collectors). The onshore industry is markedly different to that operating offshore and even then the PRRT was framed at a time when offshore activity was mainly focused on oil rather than gas. Significant changes have also occurred in the operational and commercial environment for offshore (and onshore) operations since the mid 1980s.

Extension of the PRRT needs to be done in a manner that:

- minimises complexity and compliance costs for small companies, particularly those likely to pay little or no tax
- is consistent with the offshore PRRT provisions for immediate deductibility and augmentation, including starting base values

- recognises the differences between conventional and unconventional petroleum, does not inhibit the growth of either and does not undermine state initiatives to support their development (such as royalty concessions for tight gas)
- ensures that existing problems with the PRRT are not extended to new taxpayers but are resolved for all
- improves administration of the PRRT to achieve greater consistency with the tax's policy intent and objectives.

In ongoing discussions about climate change and tax reform policies, the industry must continue to highlight the distortionary impacts of non-uniform changes in fuel taxation and fuel tax credit arrangements and continue to stress the importance of the government maintaining its commitment to eliminating taxes on business inputs.

The case for improving the capital depreciation regime in the company tax system should continue to be presented as opportunities arise.

4.6 Harnessing the environmental benefits of gas

OBJECTIVE

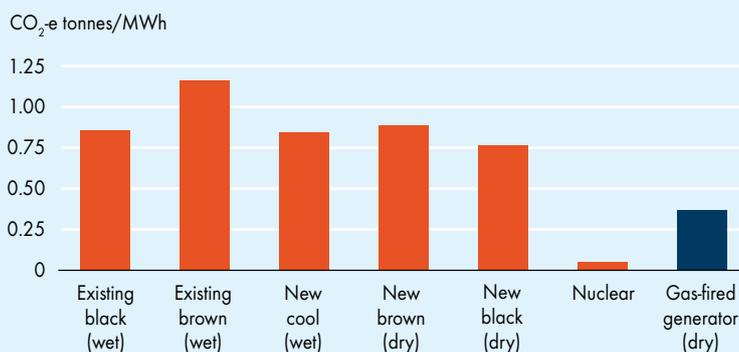
To maximise the contribution that gas makes to reducing Australian and global greenhouse gas emissions.

KEY OPTIONS

- 6.1 Australian, state and territory governments develop a more consistent national approach to greenhouse policies and programs and, to the maximum extent possible, develop common approaches in consultation with industry that:
- maintain the international competitiveness of Australian industry
 - encourage least-cost abatement and the use of commercially viable technologies to reduce emissions
 - stimulate technological innovation for economic long-term solutions
 - streamline existing regulatory frameworks for managing greenhouse gases into an overarching national framework
 - share the burden of adjustment equitably across the economy in a way that confers no unfair competitive advantages or disadvantages to particular industry sectors
 - ensure that regulatory instruments such as conditions on project approvals do not impose a cost on industry not borne by overseas competitors
 - maintain flexibility for example, to adjust policies with advances in science and technology
 - do not place 'early movers' at a disadvantage, including members of the oil and gas industry that have already implemented a range of voluntary emission abatement actions.
- 6.2 Ensure the national greenhouse gas emission reporting system introduced in July 2008 operates efficiently at least cost to industry and replaces all state- and territory-based reporting systems.
- 6.3 Maintain support for ongoing international negotiations directed at achieving a global policy response covering all major emitters, all greenhouse gases, all sources of emissions and all sequestration modes.
- 6.4 Introduce a national carbon pricing mechanism that facilitates least-cost abatement but does not impose a 'net cost' on the export gas industry until such time as overseas competitors are subject to a similar impost.
- 6.5 Review and reform energy taxation and renewable energy programs so as to remove tax- and subsidy-related distortions and ensure competitive neutrality between gas and other fuels.
- 6.6 Remove market and other regulatory barriers to gas development and review other aspects of competition and regulatory policy to ensure that they support open, competitive and efficient markets.

BACKGROUND

Figure 17 Emissions intensity by technology



Sources: ACIL Tasman, company websites/reports, McLennan Magasanik Associates, ROAM Consulting (2009)

The environmental and economic benefits from making greater use of gas to meet Australia's energy needs and those of a growing list of countries buying Australian gas, have been thoroughly researched and are widely understood. The use of gas to generate electricity in Australia and abroad can result in 50 to 70 per cent less greenhouse gas emissions than electricity generated from other fossil fuels (Figure 17).

Gas could make a far greater contribution to reducing Australia's greenhouse gas emissions at a much lower cost per tonne of emissions abated, than renewables such as solar and wind energy (Figure 18).

Increased use of natural gas also offers other environmental benefits such as reduced particulate

emissions, reduced emissions of sulphur dioxide (an important contributor to smog and acid rain) and much lower demand for water for power station cooling.

The Worley Parsons studies referred to in section 2.3.2 concluded that for every tonne of greenhouse gas emissions released in Australia from LNG production by the North West Shelf Project, 9.5 tonnes of emissions can be avoided globally when LNG displaces the use of Australian coal for power generation in China (in a subcritical coal plant, the dominant type of power plant in China). The use of CSG-LNG can avoid 4.3 tonnes of CO₂-e per tonne of CO₂-e released in Australia compared with lifecycle emissions from the use of coal in a subcritical coal plant. Even at the lower rate, a combined-cycle gas turbine (CCGT) electricity generator using 10mtpa of CSG-LNG would, over 30 years, emit 1114 million tonnes of CO₂-e less than a subcritical coal plant generating the same amount of electricity.

That is, just one of our CSG-LNG projects could avoid global emissions equivalent to more than twice Australia's current annual rate of greenhouse gas emissions (542mt CO₂-e over the year to March 2011). Australia now has three such projects and three conventional LNG projects under construction with more being planned. These studies imply that achieving the strategy target of 50mtpa of LNG production will avoid global CO₂-e emissions of 205mtpa if LNG displaces subcritical coal-fired generation (117mtpa CO₂-e when LNG displaces supercritical coal).

Likewise Australia could significantly reduce its greenhouse gas emissions by retiring the least-efficient coal-fired power stations and replacing them with more efficient CCGT plant. If as coal-fired generation is decommissioned, electricity demand between now and 2050 is met by a combination of 20 per cent renewable energy and 80 per cent gas, Australia's carbon emissions from electricity

generation would fall by around 20 per cent even while doubling the amount of electricity generated.

It is disappointing therefore that greenhouse policy continues to overlook and even hold back the potential of gas, a resource in which Australia already has a competitive advantage (by virtue of its large gas resources, established gas production infrastructure and ready access to technology), and favours renewable forms of energy in which Australia struggles to compete with the likes of Europe and China in relation to access to finance, market size and technology. Unlike renewable energy forms, the technology for the large-scale deployment of gas-fired electricity generation is available now. A study published by the Australia Institute in late 2010 found that a significant proportion of the economic benefit associated with the growth of Australia's photovoltaic industry went offshore. Photovoltaic imports rose from \$17 million in 2002 to \$295 million in 2009 (Australia Institute 2010).

Global emissions avoided

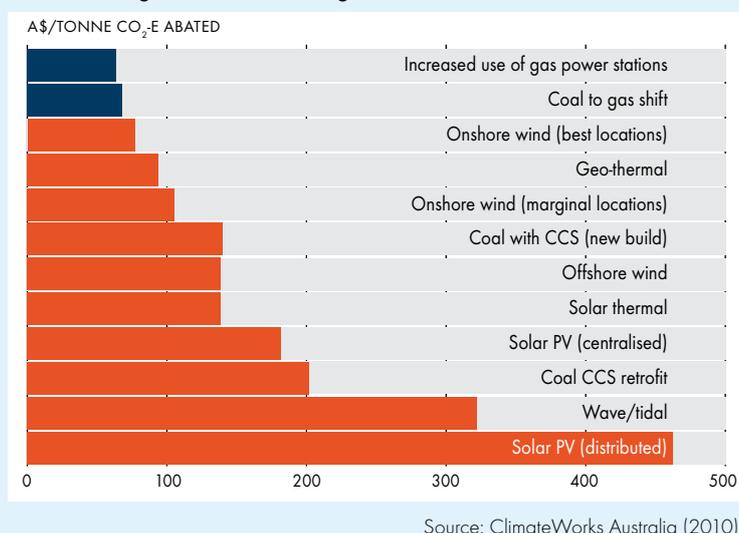
According to current construction schedules, the strategy's 50mtpa LNG production target will be met in 2014 once the Queensland Curtis and Gorgon projects start production. Together with the currently operating North West Shelf and Darwin LNG projects and the Pluto project due to start production in 2012, these five LNG projects will have a combined capacity of 51 mtpa. Their combined Australian greenhouse gas emissions will be around 20mtpa CO₂-e giving an average greenhouse gas intensity of 0.39t CO₂-e/t LNG. Adding the emissions from LNG transportation, regasification and power generation implies that the lifecycle emissions from the use of Australian LNG in combined-cycle gas turbines (CCGT) for power generation in China are 0.44t CO₂-e/MWh.

When used in CCGT, 50mt of LNG is estimated to generate 354 million MWh (7.08MWh/t LNG) and lifecycle emissions of 156mt CO₂-e (3.1t CO₂-e/t LNG). The generation of this amount of electricity from a subcritical pulverised coal power station in China would result in lifecycle emissions from the use of Australian black coal of 361mt CO₂-e (1.02t CO₂-e/MWh). Therefore, using 50mt of Australian LNG in CCGT instead of generating the same amount of electricity from using Australian coal in a subcritical coal plant, avoids global emissions of 205mtpa CO₂-e.

When LNG is compared with more greenhouse efficient supercritical pulverised coal power stations (emitting 0.77t CO₂-e/MWh), the estimate of global emissions avoided by the use of 50mt of Australian LNG instead of Australian coal is reduced to 117mtpa CO₂-e.

Emissions intensities from Table 2-3, Worley 2011a

Figure 18 Cost of abatement of alternative electrical power generation technologies



High-cost renewable schemes

Renewable energy incentive schemes will be a major driver of higher electricity prices in Western Australia and impose significant additional costs on consumers. The Authority is concerned that unless there is pressure on retailers to procure 'green' electricity at the lowest cost, then inefficient costs will be passed onto consumers.

Evidence shows the current federal and state renewable energy incentive schemes are an expensive, economically inefficient means to achieve the policy objective of greenhouse gas abatement. In comparison, a mechanism for pricing carbon would promote efficient investment and provide for a better transition from fossil fuel to renewable energy generation technologies.

ERA 2011

That and numerous other studies have pointed to the high abatement costs incurred by the renewable energy subsidy schemes introduced by Commonwealth and state governments over the past decade.

The PC estimated that the implicit abatement subsidy of the Renewable Energy Target (RET) and state solar photovoltaic schemes is between \$431 and \$1043 per tonne of CO₂ (PC 2011). The National Generators Forum is reported to have told the NSW Government in late 2010 that its solar scheme is costing between \$520 and \$640 to reduce each tonne of CO₂ and that each job created by the scheme will cost between \$130,000 and \$700,000 (The Australian 2011).

An audit report in Victoria found that the state's power generated from renewable energy had increased by only 0.3 of a percentage point to 3.9 per cent since 2002 despite state subsidies costing \$272 million (VAGO 2011). In July 2010, the Victorian Government set a large-scale solar generation target of 5 per cent of electricity generation (around 2500 GWh) by 2020. The Auditor-General estimated that reaching the target would cost \$2.4–3.4 billion in net present value terms, representing an increase in average annual household electricity bills of \$23–47 over the lifetime of the scheme.

The Managing Director of Western Australia's Verve Energy stated in May 2011 that to accommodate renewable energy projects, the utility's coal-fired generators must be cycled (turned on and off), which they weren't designed to do. Cycling meant their efficiency declined as much as 20 per cent, producing more carbon emissions per unit of power generated (The West Australian 2011).

On the other hand, gas production in Australia receives no subsidies and is being competitively disadvantaged by, for example, higher royalties than apply to Victorian coal production. Changes to resources taxation announced in July 2010 are likely to exacerbate, rather than eliminate, this market distortion.

Australia's LNG industry, already penalised by Australia's uncompetitive company tax depreciation regime, looks set to be further disadvantaged by the carbon pricing scheme to apply from 1 July 2012.

As a result, this strategy's options for harnessing the environmental benefits of gas are centred around three themes:

- achieving a more consistent national approach to greenhouse policies
- removal of subsidies and other market barriers and distortions
- the introduction of a carbon pricing mechanism that enables the lower emissions benefits of gas to be fully reflected in the domestic energy market but does not competitively disadvantage Australian gas in international markets.

ACTION TO DATE

Carbon pricing

While the development and introduction in 2012 of a carbon pricing mechanism has dominated public policy debate over the past year, some progress has been made around the first and second themes noted above. In particular, a national greenhouse gas emissions reporting system is now in place and is being progressively fine tuned to improve its administration. Several states including NSW, Victoria and Western Australia, have acknowledged the high costs attached to their solar photovoltaic schemes and have reduced or

eliminated the subsidies provided through feed-in tariffs. Indeed the experience with these schemes appears to have dampened the states' earlier enthusiasm for embarking upon their own unique greenhouse gas abatement policies and programs and increased their appreciation of the need for a consistent national approach.

However, despite introducing a carbon pricing mechanism on the grounds that it is the lowest-cost approach to reducing greenhouse gas emissions, the Commonwealth is expanding its own range of high-cost

renewable energy subsidies. The Renewable Energy Target is being maintained and significant new measures were announced as part of the *Securing a Clean Energy Future* statement in July 2011. A Clean Energy Corporation is to be established to invest \$10 billion over five years in the commercialisation and deployment of renewable energy and enabling technologies, energy efficiency and low-emissions technology. Support for carbon capture and sequestration and lower emitting gas technologies is excluded. An Australian Renewable Energy Agency is also being formed to provide grants of \$3.2 billion over nine years to renewable energy projects. These programs may disadvantage the spread of gas-fired generation capable of reducing greenhouse gas emissions at much lower cost.

The introduction of a carbon pricing mechanism will enable carbon intensity to be built into energy pricing and investment decisions in Australia. However, to be fully effective at reducing emissions at least cost, the renewable energy target and the more than 200 other climate change policies and programs administered by the federal, state and territory governments should be reviewed. Only those schemes that can address a clear market failure (not addressed by the carbon price) at least cost and do not compromise the efficiency of the carbon pricing mechanism should be retained.

While potentially driving emissions reductions in Australia, the carbon pricing mechanism will have the perverse effect of impeding the ability of Australia's gas industry to deliver even greater emissions reductions elsewhere in the world. LNG projects will receive a permit allocation of at most 66 per cent (declining over time) plus an LNG supplementary allocation to ensure that LNG projects receive an effective rate of allocation at or above 50 per cent of the project's emissions. These arrangements will place Australian LNG projects at a competitive disadvantage to projects in other LNG competitor countries since very few, if any, are subject to carbon costs. It will further add to the cost pressures facing the Australian LNG industry, reducing its ability to compete on price and capture the large, long-term gas contracts needed to underwrite new LNG projects.

Energy policy

As noted in section 2.3.3 of this report, developing a national Energy White Paper provides an opportunity to make Australia's energy markets more efficient and address impediments to the growth of Australia's energy sector, including the gas industry. However, if real gains are to be achieved some hard decisions must be taken, including further energy market reforms and the removal of subsidies and distortions to investment. These include the matters noted above as well as range of other impediments such as price controls on electricity and gas prices. A Council of Australian Governments agreement in 2010 to abolish all price controls on electricity and

gas within four years appears to have fallen away with little result.

One of the inputs into the Energy White Paper will be an update to the 2009 *National Energy Security Assessment* (NESA). The NESA aims to identify key strategic energy security issues in the liquid fuels, natural gas and electricity sectors currently, and those likely to influence the level of energy security in 5, 10 and 15 years time.

Market reform and energy security

Several energy market reforms and initiatives to improve the efficiency, security and competitiveness of the gas market are moving forward and are welcomed. The Short Term Trading Market (STTM) in gas supply established in the eastern states in 2010, has expanded with the addition of a Brisbane hub from 1 December 2011.

The West Australian Government is proceeding with the development of a Gas Bulletin Board to improve market transparency and efficiency and a Gas Statement of Opportunities to assist forward planning. Gas supply security is also being enhanced by increasing the dual-fuel capability of WA's electricity generation capacity and by encouraging increased onshore exploration for conventional and unconventional gas. The royalty on tight gas has been halved to five per cent and as noted in section 4.3, support is being provided for mobilising drilling equipment not readily available in WA. Gas security will also be enhanced by a five-fold increase in the capacity of the Mondara gas storage facility being undertaken by APA Group and Verve Energy.

As part of *CleanerQ: towards a greener Queensland policy* announced in November 2009, the Queensland Government has sought to improve market transparency and investment planning by the appointment of a Gas Commissioner and publication of an annual *Gas Market Review (GMR)* providing analysis and forecasts of the Queensland gas market.

The industry has welcomed this policy approach to strengthening and guaranteeing the integrity of the natural gas market, and providing the necessary investment confidence for both gas consumers and producers. The 2011 GMR, released on 9 September, included projections of gas production to meet demand in the eastern states domestic gas market and for LNG production. Under the medium scenario, annual gas production increases from 704PJ in 2011 to around 4200PJ in 2031. Gas reserves (currently 43,650PJ) also increase so there are no gas reserves adequacy issues in the short to medium term. However, one unlikely scenario suggests that operational factors and delays to infrastructure and reserves development due to the Queensland floods, may result in access to reserves for domestic contracting being tight over the next few years (*DEEDI 2011*).

WA Gas supply security has also been a subject of considerable discussion over recent years, triggered in part by the disruption to gas supplies from Varanus Island in 2008, a tightness in the gas market brought about a surge in resources driven gas demand and higher gas prices.

As noted in section 3.3.2, the market has responded and gas supply capacity is set to increase rapidly over the next few years. To gain a clearer picture of WA's long-term energy market and to guide policy decision making, the government began developing its Strategic Energy Initiative (SEI) in late 2009. Following two years of consultation with stakeholders, the *SEI: Energy 2031* report is expected to be released shortly.

An *Inquiry into Domestic Gas Prices* conducted by the Legislative Assembly's Economics and Standing Committee also shed further light on the WA gas market and its relationship with the LNG sector. Its report, tabled

in March 2011, included a conclusion that the state's experience since 2007 is inconsistent with a 'well-functioning' market with adequate competition. Hence it recommended a range of policy responses including the retention of domestic gas reservation and the establishment of an independent Gas Market Monitor modeled on the Queensland Gas Commissioner.

In response the industry pointed out that government interventions are themselves inconsistent with the overall push towards a 'well-functioning' market and market-based policy principles espoused in the SEI.

The government's response to the Standing Committee's report was tabled in August 2011. The government favoured retaining the domestic gas reservation policy (applied 'flexibly') over more market-based, investment-friendly alternatives such as establishing an independent Gas Market Monitor.

WAY FORWARD

As each of the policy development and reform processes referred to above moves forward, it is important to remember that energy security and competitive energy pricing are best achieved through the removal of market distortions and enhancement of competitive markets supported by a stable, consistent, efficient and internationally competitive tax and regulatory framework.

Natural gas has the potential to become a significantly larger source of domestic energy supply. However, gas is more highly taxed than other competing energy sources.

Market distortions through the use of fuel subsidies or policy interventions can also have the perverse effect of discouraging new market entrants and inhibiting supply diversity.

This can lead to suboptimal outcomes (such as the use of less efficient open-cycle gas generation to support intermittent renewable sources) or deter investment in potentially lower-cost energy options (for example, policies that require gas to be supplied from LNG projects can discourage onshore gas exploration).

The oil and gas industry faces several major challenges in promoting national and state policies that fully recognise and harness the environmental benefits of gas. Priorities for the year ahead include:

- implementing the government's carbon pricing mechanism in a way that encourages the greater penetration of lower carbon fuels competing on an equal basis without competitively disadvantaging Australia's gas export industry
- further winding back of costly and inefficient subsidies to renewable energy and rationalising policies to help develop a consistent national approach
- developing a national energy policy and the further development and implementation of state policies (including WA's *SEI: Energy 2031* and Queensland's annual *Gas Market Review* and implementation of a Brisbane hub for the STTM) with an emphasis on improving market efficiency, enhancing energy supply diversity and security and removing impediments to industry competitiveness and investment.

4.7 Implementing a national petroleum skills and vocational training plan

OBJECTIVE

An appropriately skilled workforce is available to support the growth of the Australian oil and gas industry.

KEY OPTIONS

- 7.1 Identify and better understand the industry's current and future skills and training requirements.
- 7.2 Develop and implement strategies for increasing the size and develop the capability of the industry's workforce through:
 - strategic workforce planning
 - key skill pool development
 - a focus on key pathways to employment such as cadetships, apprenticeships, traineeships and graduate programs
 - increased participation from under-represented groups including indigenous, female and mature-age workers.
- 7.3 Improve understanding of the industry's employment opportunities (among schools, career advisers, undergraduates and other elements of the Australian workforce).
- 7.4 Influence governments to ensure regulatory, legislative and funding environments that facilitate the development and retention of the required skills for the industry in Australia, including through appropriate levels of skilled migration.

BACKGROUND

The availability of sufficient skilled labour to support the growth of Australia's oil and gas industry continues to be of concern and hence a high value-adding priority in the Upstream Oil and Gas Industry Strategy. The potential for labour shortages to delay project timetables and add to project costs is significant if there is insufficient early action to expand training activity and labour migration programs. Shortages could be compounded by the concurrent rapid growth in the mining industry and by reconstruction activity resulting from the cyclones and floods experienced in eastern Australia during the summer of 2010–11.

The areas of greatest concern are in the supply of trades and skilled labour for building new projects over the next five years or so and in the supply of adequately trained and experienced technical staff to operate new and existing projects over the longer term.

In July 2010, the National Resources Sector Employment Taskforce (NRSET) estimated that the number of short-term construction jobs in the resources sector is likely to peak at around 45,000 during 2012 and 2013 and that the sector would experience a shortfall of 35,800 tradespersons over the period to 2010 to 2015 (*Australian Government 2010a*). New LNG trains operating by 2015 could potentially create between 1800 and 3200 professional and trade jobs and there will be a further 2000 replacement job opportunities in oil and gas each year as workers leave the industry for other industries or to retire.

In May 2011, Skills Australia updated the NRSET report and noted that:

"The outlook is for even stronger growth in production and exports of resources commodities than estimated by NRSET, accompanied by greater expansion of productive capacity in the resources sector than anticipated by NRSET. Many major resource investment projects which were previously tentative have now been confirmed. Advanced major projects in April 2011 were valued at \$173.5 billion, compared to \$109.6 billion when NRSET reported in June 2010, representing an increase of \$64.4 billion".

Skills Australia concluded that:

"It therefore seems likely that there will be a more rapid and protracted build up of construction labour demand than was the case when NRSET reported".

Skills Australia 2011

Consequently, Skills Australia estimated that the number of short-term project construction jobs in the resources sector could range from 154,400 (low scenario) to 287,000 (high scenario) compared to NRSET projections of 103,000 to 255,000.

At the same time, labour supply has tightened. National unemployment has declined by 53,200 since NRSET reported and grants for temporary business visas and visa grants under the Skilled Migration Program declined by 31 and 13 per cent respectively in 2009–10.

Part of the higher labour demand outlook presented by Skills Australia is attributable to growth in the LNG industry. Since the NRSET report, three CSG-LNG projects in Queensland have taken final investment decisions and are now adding to the demand for construction labour. Each of the CSG-LNG projects is estimated to require a construction workforce of 5000–6000 people.

As indicated in Table 3, several other LNG projects are also planning to proceed to construction during the remainder of 2011 and 2012 (including the Ichthys,

Sunrise and Browse projects and expansion of Australia Pacific LNG). Each of these, if committed, will further add to the demand for tradesmen, engineers and other skilled labour.

Macquarie Equities Research estimated that Australia's LNG construction workforce could be over 40,000 people during the peak construction period in 2015 and 2016 (*Macquarie 2011b*). It also said the growing scarcity of labour is driving wage inflation, adding to Australia's already high construction costs.

ACTION TO DATE

Consistent with the four options described above, the oil and gas industry, other parts of the resources sector and governments have been working to develop, implement and further refine strategies for meeting the projected short- and long-term skilled labour requirements. These have centred on:

- studies, updated regularly, to better define the industry's skilled labour requirements for constructing and operating new gas projects
- identifying and providing the training resources needed to upskill Australia's gas project construction and operations workforce
- developing strategies for promoting careers in the oil and gas industry and increasing participation among under-represented groups, particularly women and indigenous Australians
- improving skilled migration programs to more efficiently and effectively meet labour requirements that cannot be sourced from within Australia.

During 2011, APPEA modified its workforce strategy to more clearly focus on providing strategic direction in workforce capacity development. Consistent with options 7.1 to 7.4 above, priority will be given to:

- identifying the industry's labour requirements
- developing a contractor engagement strategy for workforce planning
- developing an oil and gas industry production/operations training strategy
- liaising with governments to ensure the industry's skills requirements are reflected in their policies concerning workplace relations, employment, education, training and migration
- promoting the industry's approach with other stakeholders
- collaborating with contractors and service providers on workforce planning
- developing information to improve understanding of the industry's employment opportunities and career pathways.

Understanding the needs

During 2011, several government and industry organisations have published new or updated studies of skilled labour requirements in the resources industry.

Following release of the NRSET report, the Australian Government commissioned Skills Australia to prepare annual reports about the resource's sector likely demand for labour and the supply of skills available to meet the sector's skill needs.

The first of these reports was published in May 2011 in conjunction with relevant Australian and state government agencies and with the assistance of industry.

It refers to other studies undertaken by other government and industry organisations over recent times, including work by:

- the Minerals Council of Australia
- the Western Australia Chamber of Minerals and Energy
- the WA Department of Training and Workforce Development
- Energy Skills Queensland
- Construction Skills Queensland
- West Australian Department of Training and Workforce Development.

Construction Skills Queensland (CSQ) for example, an independent industry-funded body, commissioned a *CSG/LNG Industry Construction Workforce Plan* in 2010. It indicated that about 9000 workers, primarily trade workers, will be required to build the initial four LNG trains projected to be commissioned by 2014. CSQ also recommended 10 strategies to help meet the skilled labour requirements of the CSG-LNG industry.

As a result of these recent and ongoing studies and with several projects proceeding to construction, a better understanding has been developed around the future skilled labour requirements of the oil and gas industry.

Increased training

The Australian, Queensland and West Australian Governments and the industry itself have each initiated and/or expanded a range of training programs aimed at meeting the short- and long-term skilled labour needs of the oil and gas industry. These include:

- establishing a \$200 million *Critical Skills Investment Fund* to form partnerships that provide training and employment opportunities in the resources, construction, renewable energy and infrastructure sectors
- expanding the *Critical Skills Investment Fund* to form a *National Workforce Development Fund* with government financing increased to \$585 million over four years, to be matched by industry, and expected to support up to 130,000 new training places
- introducing accelerated apprenticeships with progression based on competency (\$100 million) and apprenticeship mentoring support (\$101 million)
- adding other measures to the *Building Australia's Workforce* program in the 2011 - 12 budget such as reforms in vocational education and training (\$1.75 billion over five years) and help for mature-age workers with trade skills but no formal qualifications (\$30 million over three years)
- introducing a *Coal Seam Gas Drilling Skills Program* funded by the Australian and Queensland Governments for entry level positions in the CSG drilling industry
- developing the *Gladstone Workforce Skilling Strategy*, funded by the Australian and Queensland Governments, to train more than 200 people for employment in jobs associated with the CSG-LNG plants in Gladstone
- additional funding for vocational education and training in Western Australia with the 2011 - 12 budget including \$33 million to create an additional 12,000 training places and \$110.6 million over four years to priority areas of training in regional areas
- introducing *Skilling WA*, a workforce development plan to meet the skilled labour needs of the state through workforce planning, partnership and information sharing, investment in workforce skills and performance monitoring
- additional industry contributions towards regional training facilities such as the new Larrakia Trade Training Centre in Darwin (\$3 million contribution by Inpex and Total E & P)
- new and expanded scholarship programs and other forms of training support such as Origin Energy's *Community Skills Scholarship Program* that in five years has helped more than 75 apprentices complete their apprenticeships in regional areas

- establishing the *Energy Apprenticeships Group* by the Chamber of Commerce and Industry WA and the Australian Centre for Energy and Process Training (ACEPT) to support the training of apprentices for the mining, oil and gas industries
- proposed expansion of ACEPT to incorporate engineering training.

As noted in section 3.2.1, FLNG is a revolutionary innovation that will allow the production, liquefaction, storage and transfer of LNG at sea, helping to open up new offshore natural gas fields that are currently too costly or difficult to develop. To train the world's first FLNG operators, Curtin University and Shell Development Australia will establish a Global Centre for FLNG Learning and Research. The Centre will be based at Curtin's Bentley Campus in Perth and will be officially launched at the end of 2011. The centre will provide leadership, management and technical education specifically relevant to the FLNG industry and involve partnerships with vocational education and training providers (including ACEPT).

The high demand for skills and labour and the entry of large numbers of workers from other industries and backgrounds will place an increased demand on supervisor training. Many people may find themselves moving in and out of 'supervisory' roles with little training in the 'management' and 'people' side of supervision, as opposed to the technical. To address this issue the industry has introduced two targeted safety training programs for areas of highest risk. The common safety training program applies to all workers on offshore facilities while the supervisor competency program is aimed at offshore construction supervisors.

Increasing awareness and promotion

Members of the industry are engaged at the local level with schools and universities and support education centres around (or connected to) Australia's major petroleum production centres. As part of a new *Coherent Career Pathways Program*, APPEA has developed an *Oil and Gas Careers DVD* to promote careers pathways into and through the industry. Further work is now underway to develop programs that improve foundation skills, basic literacy and numeracy to increase participation and career pathways for women, indigenous Australians and mature-age workers.

Each year at the APPEA Conference, young students are able to attend a full day interactive workshop and visit the oil and gas industry exhibition to meet the industry face to face. APPEA introduced two new engineering scholarships in 2011 and is working with the universities and other stakeholders to establish a scholarship specifically to help young indigenous Australians enter and complete an engineering trade or university.

Skilled migration

The oil and gas industry welcomed the government's 2011 - 12 budget decision to introduce *Enterprise Migration Agreements*, a new temporary migration initiative to help address the skills needs of the resources sector. They are limited to resource projects costing more than \$2 billion and requiring a peak construction workforce of more than 1500 people.

To be able to make use of this scheme, companies will have to demonstrate effective and ongoing local recruitment efforts and develop a comprehensive training plan, demonstrating how the project will invest in the

up-skilling of Australians to meet future skill needs in the resources sector. Proposed qualification criteria and administrative arrangements could reduce the scheme's flexibility and make it overly complex and difficult to comply with. These are the subject of further discussions between the resources industry and the government.

In March 2011, the West Australian Government introduced a *WA Skilled Migration Strategy* to deliver a more integrated approach to skilled migration, provide information and migrant settlement services and, in dialogue with the federal government, refine migration processes to support a more flexible and responsive migration program.

WAY FORWARD

The industry, governments and training providers have made a solid start at developing a suite of measures for responding to the expected growth in the industry's skilled labour requirements.

However, much remains to be done in developing and implementing a number of these programs.

The approaches taken must be flexible and adaptable to changing circumstances in the industry and in Australia's skilled labour market. In the year ahead, priority must be given to:

- continuing to refine projections of skilled labour demand and shortages so as to enable solutions to be accurately defined and targeted
- working with contractors, governments and training providers to further develop collaborative partnerships and training solutions to meet the industry's short-term construction-based needs as well as longer-term production and operations requirements
- developing a holistic career information and industry promotion strategy, aimed at students as well as under-represented groups like women and indigenous Australians
- ensuring that the *Enterprise Migration Agreements* scheme is administratively efficient and transparent and, while promoting the employment and training of Australian workers, does not impose unnecessary costs and conditions on project developers.

Skills and labour programs must be flexible and adaptable to changing circumstances.



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6 Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences	mboe	million barrels of oil equivalent
ACEPT	Australian Centre for Energy and Process Training	MCMPR	Ministerial Council on Mineral and Petroleum Resources
AMOSC	Australian Marine Oil Spill Centre	MPA	Marine Protected Area
bcf	billion cubic feet	MRRT	Mineral Resource Rent Tax
BMP	Bioregional Marine Plan	mtpa	million tonnes per annum
BREE	Bureau of Resources and Energy Economics	MWh	Megawatt hours
CCGT	combined-cycle gas turbine	NOPSA	National Offshore Petroleum Safety Authority
CNOOC	China National Offshore Oil Corporation	NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
CO₂-e	carbon dioxide equivalent	NOPTA	National Offshore Petroleum Titles Administrator
CSG	coal seam gas	NPV	net present value
CSIRO	Commonwealth Scientific and Industrial Research Organisation	NRSET	National Resource Sector Employment Taskforce
CSQ	Construction Skills Queensland	OECD	Organisation for Economic Co-operation and Development
EPBC Act	Environment Protection and Biodiversity Conservation (EPBC) Act 1999	OGP	International Association of Oil & Gas Producers
FLNG	floating liquefied natural gas	PC	Productivity Commission
FPSO	floating production, storage and offtake vessel	PJ	petajoules (10 ¹⁵ joules)
GA	Geoscience Australia	PRRT	Petroleum Resource Rent Tax
GDP	gross domestic product	PTG	Policy Transition Group
GIRG	Global Industry Response Group	PTTEP	PTT Exploration and Production Australasia
GISERA	Gas Industry Social and Environmental Research Alliance	RET	Renewable Energy Target
GJ	gigajoules (10 ⁹ joules)	SEI	Strategic Energy Initiative
GMR	Gas Market Review	STTM	Short Term Trading Market
GWh	gigawatt hours	t	tonne
IEA	International Energy Agency	tcf	trillion cubic feet
kbd	thousands of barrels a day	TJ	terajoules (10 ¹² joules)
LNG	liquefied natural gas	TJ/d	terajoules per day
LPG	liquefied petroleum gas	TWh	terawatt hours



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