



Australian Government  
Department of Industry

# Energy White Paper

## GREEN PAPER 2014

*to inform preparation of a White Paper*



# Energy Green Paper

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# Foreword

Australia's economy and prosperity are built on access to secure, affordable and reliable energy.

Our energy diversity is one of Australia's natural strengths and one of our most potent competitive advantages. That diversity has provided Australian homes and business access to the energy required to build our industries and our communities.

Long an exporter of coal, Australia is now entering a new phase in which our gas and uranium exports will also supply global markets hungry for energy security.

While Australia consolidates its position as an energy superpower, it is essential that we have a long-term framework in which the energy sector can grow.

This Green Paper builds on our pre-election Policy for Resources and Energy in which we promised coherent, consistent energy policy to protect jobs and investment, and take cost pressures off energy users.

Getting our policy settings right will facilitate further growth and enhance productivity. This means ensuring Australia remains a premier destination for investment in energy and resources. The Government has lifted the burden of the carbon tax and the mining tax and is continuing to cut red tape and unnecessary regulation, all of which will enhance Australia's attractiveness for new investment.

Sound policy development also means working with the States and Territories to improve the cost effectiveness of electricity supply and increasing momentum for productivity enhancing market reforms, as well as removing barriers to new gas supplies and assisting to develop well-functioning gas markets. And most importantly it means ensuring open access to global energy markets, encouraging the productive use of energy in Australia and assisting the development and research of new technologies.

We want to work closely with industry, Governments and the community to develop and use the nation's resources to benefit all consumers and accordingly I invite and welcome your comments on this Green Paper.

Hon Ian Macfarlane MP  
Minister for Industry





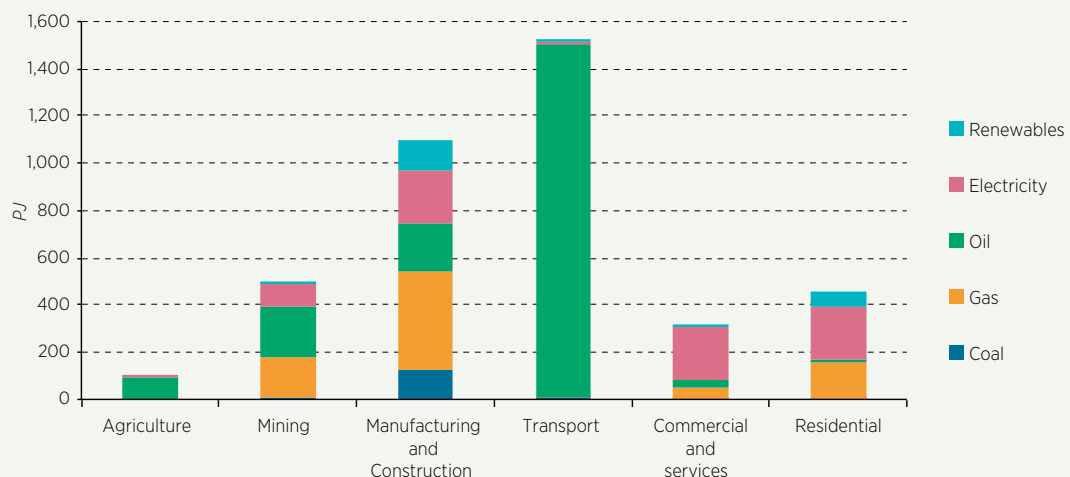
# The energy sector in Australia in brief

## Our energy sources

Australia has plentiful and diverse energy resources, including large amounts of coal, gas, uranium and renewable energy. Australia also produces large amounts of oil, but still imports most of its liquid (transport) fuels.

Australia's energy infrastructure provides a solid basis for continued economic growth. Rail and ports deliver resources to export markets while poles and wires supply electricity, and pipelines transport gas, to households and businesses. Imported liquid fuels have well-established supply chains and markets.

Energy, whether it is in the form of electricity, gas, transport fuels or exports, underpins our economy and high standard of living. Productivity improvements in the energy sector, from extraction to use, add to these benefits. Different sectors of the Australian economy rely on different sources of energy as shown below.



Source: Bureau of Resources and Energy Economics, 2014, *2014 Australian Energy Statistics Update*, Canberra (consumption calculated as final energy use)

## Our energy systems

### Electricity

Electricity transmission networks transport electricity from power stations to electricity distributors and large end users. Electricity distribution networks carry electricity to customers, including residential, business and industrial users. Retail services are the final link in the electricity supply chain. Retailers buy electricity in wholesale markets, package it with costs associated with the provision of network services and sell it to customers.

The National Electricity Market (NEM) runs across Queensland, New South Wales, Victoria, South Australia and Tasmania as a connected grid. It sources electricity from a pool of generators that sell into a wholesale market. Other smaller grids service regions outside the NEM, and are managed by the relevant state or territory.

State and territory electricity utilities have, over time, been separated into generation, poles and wires (transmission and distribution), and retail businesses. The extent to which these businesses have been deregulated and privatised varies across states and territories. Most reform has happened in the electricity generation and retail sectors.

## Gas

Gas markets typically involve either long-term contracts between suppliers and major users, or regulated retail sales to small users. The gas pipelines are privately owned, and only some sections are regulated by government. The eastern gas market is rapidly transforming, from a purely domestic market to one that is linked to an export market, exposing it to international competition and pricing. The western gas market started exporting in 1989 and the northern market in 2006.

## Liquid (transport) fuels

Liquid fuel supply is maintained using domestic refineries, crude oil and refined product import terminals, and other stockholding facilities. The fuels are distributed using complex transport systems and retail supply arrangements. Retail prices are not regulated, and effective competition is the basis for securing the best prices for consumers.

## Energy exports

Australia is the world's second largest exporter of coal, number three exporter of uranium, and number four exporter of gas. These exports provide jobs and export income, and helped Australia withstand the global financial crisis. Energy resources exports contributed \$69 billion in income<sup>1</sup> and employed around 123,00 people in 2012–13.<sup>2</sup> Energy related industries more broadly contributed nearly \$102 billion (6.7 per cent) to Australia's Gross Domestic Product in the same year.<sup>3</sup>

The International Energy Agency forecasts that global energy demand will grow by a third by 2035, and grow by almost a fifth in the demand for coal.<sup>4</sup>

## Our energy markets are changing

Historically, energy has been both reliable and affordable. Households have enjoyed low cost energy for many decades, and Australian businesses have been globally competitive because of it. Australia has been one of the world's most attractive places to invest because of its low energy costs. Now, however, the energy market is a rapidly changing global market.

A broader range of energy sources are being pursued as technology to make alternative sources more cost-effective advances. Building new capabilities and government policies for energy security and lower greenhouse gas emissions also influences markets. Once isolated markets are becoming increasingly linked with other markets, creating more consistent global pricing.

Most energy analysts confirm that coal will continue to be a major source of global energy for decades to come. It will be important that coal produces the most energy for the lowest emissions, but this requires major capital investment in a market that is currently oversupplied. Gas provides a lower emissions source of energy for electricity generation, but in Australia it is becoming an increasingly more expensive fuel source than coal. Nuclear energy remains a serious consideration for future low emissions energy, while renewable energy will continue to play an important role, especially in regional and remote areas that are off the main electricity grid. The development of large-scale energy storage could be a game-changer as it can smooth the intermittent supply that typifies renewable energy, and reduce the need for reliable baseload energy from other sources.

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1 Bureau of Resources and Energy Economics, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra

2 ABS cat. no. 8155.0, Australian Industry (various issues)

3 ABS cat. no. 5204.0, Australian System of National Accounts

4 International Energy Agency, 2013, *World Energy Outlook 2013*, Paris (under the new policies scenario)



New energy technologies can emerge quickly, with the most recent example in Australia being the rapid uptake of solar photovoltaic panels. Australia needs to take advantage of similar technology changes, many of which will first happen overseas, that can contribute to the reliable and affordable supply of energy.

Imposing unnecessary regulatory barriers and providing subsidies distorts energy markets and does not allow the market to follow its natural course, letting competition, innovation and better information provide more choice for consumers.

Energy should be used productively, whatever its source and use. This means either using less energy to produce the same output, or producing more output with the same energy. More productive use of energy lowers costs by delaying the need for new supply infrastructure, and relieves the need for price increases to recover that investment. More productive energy use also reduces Australia's emissions intensity. Development and uptake of new technologies plays an important role in increasing the productivity of energy use.

## The Government's approach

There is no 'silver bullet' to achieve the change needed in the energy sector. Coherent and constructive market reform, and properly integrated policies, will give industry and consumers confidence in energy policy.

Reforms are needed to drive productivity throughout the sector. Improvements in productivity can flow from increasing the return on capital, reducing labour costs, more productive use of energy, clearer community support for resources projects, more efficient regulation, and infrastructure availability. This will maintain the supply of reliable and affordable energy to households and businesses. It will also allow energy resources exports to continue to grow as a source of employment and wealth for the nation.

The Government has already taken steps to improve the commercial environment for the energy sector by repealing the carbon tax and the Minerals Resource Rent Tax (MRRT). It has also released the report of the independent panel that reviewed the Renewable Energy Target and will soon announce its response to the report.<sup>5</sup> The Government is also committed to:

- introducing the Emissions Reduction Fund
- driving state and territory electricity tariff reform through the COAG Energy Council
- supporting the sale of state and territory owned electricity assets through the Asset Recycling Initiative.

The Government will pursue opportunities to increase energy resources investment. The country's natural endowment of energy resources, paired with Asia's increasing demand for them, provides an ongoing opportunity for export growth. To make the most of this opportunity, Australia must address the issues that detract from its investment attractiveness. Australia should act to secure projects currently 'in the pipeline', before the investment is permanently shelved or redirected to trade competitors.

To be a more attractive investment destination than other resource rich countries, Australia must be seen to be open for business, with a stable and predictable policy environment that also protects the national interest. Inappropriate taxes and regulation, such as the carbon tax and MRRT, stifle the investment and innovation needed to create jobs and wealth.

Productivity, through innovation, will preserve Australia's position as a leading global energy provider. Examples include the booming liquefied natural gas (LNG) export industry in Queensland, which will be the first in the world to bring onshore coal seam gas to export markets, and Australia's world-leading deployment of floating LNG (FLNG), which provides a new way to economically develop harder-to-reach offshore reserves.

<sup>5</sup> Warburton, D, Fisher, B, In't Veld, S, Zema, M, 2014, *Renewable Energy Target Scheme – Report of the Expert Panel*, Canberra

Government cannot simply mandate the use of local labour and industries, but must work with industry to provide a skilled and productive workforce, and help local businesses compete with international suppliers. This helps competitive local suppliers to apply skills and products overseas, further growing the export of Australian services.

The Government will take opportunities to improve the cost-effectiveness of electricity prices. Prices have increased by over 50 per cent in the past four years largely due to network upgrades.<sup>6</sup> There is debate over the necessity for all of the upgrades to improve the reliability of electricity networks. Other cost drivers, such as the carbon tax, and environmental schemes like solar feed-in-tariffs, have also come at a cost to energy consumers. However, other factors have stabilised prices, including the recent slowdown in investment, and changes to the rules determining permitted rates of return for those investments.

There is a need for some regulation to produce the best outcomes for consumers. However, it is important to avoid inappropriate interventions by governments that get in the way of business competition and innovation that, in turn, leads to competitively-priced energy. Markets need to work in a way that gives consumers choice in how they access their electricity, and also gives suppliers the ability to respond to those choices. Electricity market reform should feature removal of unnecessary regulation, privatisation of government-owned assets, and more consumer choice.

More flexible pricing can lower electricity use during times of peak demand, by imposing higher prices when electricity is most costly to deliver. Spreading use more evenly in this way lowers the cost of supply. However, flexible pricing arrangements only work when consumers have adequate information about their use, and the cost, of electricity. This requires more advanced residential electricity meters than those currently in most houses.

The Government will take opportunities to improve gas supply and market operation. As the sources of gas are changing, it is becoming more expensive to extract, and the growing export of LNG is affecting gas markets as increased competition from higher priced international markets pushes up local prices. All parts of the gas markets, from production to use, need to be examined under these new market conditions.

Better transparency, including of supply availability and pricing within gas markets, is also needed. Additional supplies of gas are needed to avoid potential near-term gas shortages on the east coast, and ensure long-term supply availability. New unconventional sources such as coal seams and shale gas also give potential for huge growth in export earnings. The development of this industry is of national importance, because the growth in gas exports, coupled with ongoing coal and uranium exports, supports Australia's position as a regional energy superpower.

The Government will continue to monitor liquid (transport) fuel supply. More diversity in, and more efficient use of, cost-competitive sources of liquid fuel for transport would increase security of supply and help to reduce fuel costs. Examples of such diversification measures could include alternative fuels such as biofuels and natural gas, technologies such as electric vehicles, vehicle efficiency standards and improved transport routing.

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6 Australian Energy Market Commission, 2013, *2013 Residential Electricity Price Trends report*, Sydney

# The Energy White Paper process

The Australian Government has committed to an Energy White Paper that focuses on deregulation, competition and productivity. This will encourage efficient energy markets, holding down costs for consumers. Making the sector more globally competitive will also help it attract investment. The Energy White Paper will set the foundations for the future reliable supply of competitively-priced energy in Australia.

The release of this Green Paper is the second step in consultation on the Energy White Paper. An Issues Paper was released in late 2013, responding to the Terms of Reference (**Attachment 1**) and seeking comment on 28 identified issues. The Eastern Australian Domestic Gas Market Study was released for consultation at the same time.<sup>7</sup>

## Key themes

The 260 submissions received in response to the Issues Paper helped to consolidate and prioritise concerns, and identify opportunities. Combined with consultation on the Eastern Australian Domestic Gas Market Study, four key themes emerged for this Green Paper.

1. Attracting investment – improving regulation, skills, labour productivity and supply chains to make Australia a preferred investment location.
2. Putting downward pressure on electricity price rises – driving regulatory and market reform to constrain future price rises, and increase competition and consumer choice.
3. Gas supply and market development – bringing on more supply, an industry development strategy for unconventional gas as well as further work on an overall gas market development plan.
4. Future energy supply – securing reliable and affordable energy in a technology neutral way that could also help to lower emissions.

## Energy White Paper in context

The Australian Government has repealed the carbon tax and Minerals Resource Rent Tax, and intends to put in place its Direct Action Plan, including the Emissions Reduction Fund, to reduce greenhouse gas emissions. The Australian Government has also released the report of the independent panel that reviewed the Renewable Energy Target (RET). It will soon announce its response to the report, which outlines the extent of the RET's impact on electricity prices and the range of options available to reduce impact.<sup>8</sup>

As well as the RET Review, the Australian Government will deliver other white papers interlinked with the energy sector, including on Agricultural Competitiveness and Northern Australia. Reviews of Competition Policy, Taxation, and Vocational Education and Training will also cover relevant issues. The Energy White Paper will support the vision set out in the Australian Government's Industry, Innovation and Competitiveness Agenda, because energy prices are critical to the competitiveness of Australian businesses.

The Australian Government is hosting the G20 this year. The G20 is working to strengthen global energy markets and to build collaboration between major energy producers and consumers. This will help to make energy markets more resilient. The G20 is also looking at how to promote energy efficiency and exploring ways to improve gas markets in particular. These issues are important to Australia given our status as a major energy and resources exporter, and a significant importer of liquid fuels.

These efforts, combined with the Energy White Paper, will best position Australia to meet its energy demands now and in the future.

<sup>7</sup> Australian Government Department of Industry and Bureau of Resources and Energy Economics, 2014, *Eastern Australian Domestic Gas Market Study*, Canberra

<sup>8</sup> Warburton, D, Fisher, B, In't Veld, S, Zema, M, 2014, *Renewable Energy Target Scheme Report of the Expert Panel*, Canberra

# Process for making submissions to this Green Paper

The Government is committed to consulting widely on the development of the Energy White Paper.

## Energy White Paper process



**The Issues Paper** provided an overview of the identified issues of interest to the Government and outlined questions to prompt discussion and input from stakeholders.

**The Green Paper** using submissions in response to the Issues Paper and the Eastern Australian Domestic Gas Market Study, assesses the key issues of energy resources investment, electricity prices, gas supply and market operation, and future energy supply, and seeks comment on potential policy approaches.

**The White Paper** presents the Government's strategies and policies to deliver key energy reform outcomes. The White Paper is expected to be released in late 2014.

Key dates for this process are outlined below.

|   |                    |
|---|--------------------|
| Announcement of Terms of Reference          | 5 December 2013    |
| Release of the Issues Paper                 | 17 December 2013   |
| Release of the Green Paper                  | 23 September 2014  |
| Due date for submissions on the Green Paper | 4 November 2014    |
| Release of the Energy White Paper           | Expected late 2014 |

Written submissions on the Energy White Paper — Green Paper will be considered in a consultative process leading up to the release of the White Paper, expected later in 2014.

Submissions are due by **4 November 2014**. Any submissions received after this date will be considered at the Government's discretion. Submissions made in response to the Energy White Paper — Issues Paper will also continue to be considered. Submissions made in response to the Issues Paper can be re-submitted in full or in part, taking into account the additional information reflected in the Green Paper.

Submissions can be made:

**Online at:**

[www.ewp.industry.gov.au](http://www.ewp.industry.gov.au)

**By mail to:**

Energy White Paper Taskforce  
Department of Industry  
GPO Box 9839  
CANBERRA ACT 2601

For further information, or to request a hard copy of the Green Paper, please email [ewp@industry.gov.au](mailto:ewp@industry.gov.au).

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All submissions including comments, opinions and responses to questions will be posted to the Energy White Paper website, unless you have clearly indicated your preference for confidentiality. Submissions marked as confidential will not be published on the Energy White Paper website.

The Department will collect from all submissions, personal information including name, email address, State/Territory of residence and/or the organisation you represent (if applicable) for the purposes of the Energy White Paper consultation process. This personal information will be included on the Energy White Paper website to identify your submission, unless it is marked confidential. Contact information such as email addresses will not be published.

All submissions, including personal information, may be disclosed to the Minister for Industry, staff members of the Minister's Office and other Commonwealth agencies for the purposes outlined above.

The Department reserves the right to refuse to publish submissions, or parts of submissions, which contain offensive language, potentially defamatory material or copyright infringing material.

A request may be made under the *Freedom of Information Act 1982* (Cth) (FOI Act) for a submission marked confidential to be made available. Such requests will be determined in accordance with relevant provisions of the FOI Act.

The Department respects your rights to privacy under the Privacy Act and understands that from time to time you may not want to provide the Department with your personal information. If you choose not to consent to the collection, use and disclosure of your personal information as outlined above, you will be unable to make a submission through the Energy White Paper online submission platform, Citizen Space. You can, however, send a submission to the postal address or the email address above.

For further information about how the Department handles personal information please refer to the Department's Privacy Policy at [www.industry.gov.au/Pages/PrivacyPolicy.aspx](http://www.industry.gov.au/Pages/PrivacyPolicy.aspx)



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# Executive Summary

The Energy White Paper is central to the Australian Government's economic reform agenda for a strong and prosperous national economy. Reliable and affordable energy, used productively, supports business competitiveness, lowers the cost of living, and grows export income.

There is no 'silver bullet' to achieve the change needed in the energy sector. Coherent and constructive market reform and properly integrated policies will give industry and consumers confidence in energy policy.

Reforms are needed to create competition, and drive innovation and productivity. Competition encourages innovation, leading to better products and services. It also encourages better prices. Competition is best enabled through a deregulated environment. Sometimes, however, regulation is needed to protect consumers and the environment.

Competition and deregulation improve productivity. Keeping costs down in the global energy market requires a focus on productivity in the extraction, production, supply and use of energy. Improved productivity will help attract investment, lower the cost of doing business in Australia, and lower household energy costs. The more productive use of energy also reduces Australia's emissions intensity.

This Green Paper includes market reforms designed to attract energy resources investment, stabilise energy price rises, and prepare for the nation's future energy security.

## Chapter 1: Attracting energy resources investment

Our economy benefits enormously from the export of energy resources, in the order of \$69 billion in export earnings in 2012-13.<sup>9</sup> We need policies that attract the investment required to continue growth in the sector. The Australian Government is committed to providing policy stability and certainty as a priority so that Australia is an attractive investment destination.

Australia must be a more attractive investment destination than other resource rich countries. Inappropriate taxes and regulation, such as the carbon tax and the Mineral Resources Rent Tax (MRRT), have been stifling the investment and innovation needed to create jobs and wealth. They have been repealed but productivity still needs to be improved. Such improvements can flow from increasing the return on capital, reducing labour costs, productive use of energy, achieving clearer community support for resources projects, more efficient regulation, and infrastructure availability. Productivity and innovation will preserve Australia's position as a leading global energy provider. For example, the booming liquefied natural gas (LNG) export industry in Queensland will make Australia the first nation in the world to bring onshore coal seam gas (CSG) to export markets.

Being a more attractive investment destination than our trade competitors means having a productive workforce with the right skills. Government needs to work with industry to provide a skilled and productive workforce, and help local businesses to compete with international suppliers. Open and free access to publicly funded geo-scientific and environmental information will also help encourage exploration and the timeliness of approvals.

Australian Government reforms to improve the business environment will help companies as they refocus on improving the productivity of their capital investments in a competitive global environment. This chapter sets out how the Government will ensure Australia is open for business.

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<sup>9</sup> Bureau of Resources and Energy Economics, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra

## Chapter 2: Electricity prices

Electricity prices have recently increased sharply, with household electricity prices rising by around 50 per cent nationally over the past four years.<sup>10</sup> This price rise mainly reflects investment in poles and wires to ensure reliable supply to customers during periods of highest demand. The carbon tax and other environmental policies, such as solar feed-in-tariffs, have also affected prices. Grid-based electricity demand has fallen, despite anticipated growth in demand. Higher prices resulted from increased investment at a time when falling demand reduced the volume of sales across which investment could be recovered. The recent slowdown in network investment, and changes to the rules determining permitted rates of return for those investments, have stabilised prices.

Imposing unnecessary regulatory barriers and providing subsidies distorts energy markets, and does not allow the market to follow its natural course. Privatisation and greater competition are needed to drive the innovation and productivity that leads to better products and services for consumers. Markets need to work in a way that gives consumers choice in how they access their electricity, and suppliers the ability to respond to those choices.

States and territories need to reform the way that electricity is priced, so that households and businesses can take more control over the way they use electricity. Such pricing can lower electricity use during times of peak demand by imposing higher prices when electricity is most costly to deliver. Spreading use more evenly in this way lowers the cost of supply. However, flexible pricing only works when consumers have adequate information about their use, and the cost, of electricity. This requires more advanced residential electricity meters than those currently in most houses. These measures, however, will not take us back to the past when electricity was cheap because of government subsidies that ultimately, and indirectly, cost consumers. We need to complement structural reform with a focus on productivity to keep costs as low as possible.

## Chapter 3: Building gas supply and improving market operation

Australia's gas markets are changing. The east coast market, which until now has only been a domestic market, is preparing to export LNG. Supply now needs to meet domestic and international demand, and domestic prices naturally will start to match higher international prices. This export industry provides an enormous opportunity for the nation's economy. The east coast market is also starting to need unconventional gas resources as more conventional resources are depleted. Some states have regulatory and planning barriers preventing needed supply. These barriers are creating potential near-term supply shortages on the east coast, and also increasing prices. Increasing supply is the best way to ease the pressure, but increasing prices are nonetheless inevitable. The timely increase of gas supply must be supported by regulation that addresses community and environmental concerns. This effort should be supported by improved environmental and scientific data to inform decisions made by communities and landowners.

There is also an opportunity to improve transparency and competition by further developing the emerging gas trading markets. Governments and industry can work together on innovative strategies for better gas market function. An example is the Wallumbilla Gas Supply Hub in Queensland that provides for more open gas trade.

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<sup>10</sup> Australian Energy Market Commission, 2013, *2013 Residential Electricity Price Trends report*, Sydney

## Chapter 4: Security, innovation and energy productivity

Australia's energy security arrangements have so far effectively avoided major disruptions to energy supply. The potential near-term shortage in east coast gas supply and national liquid fuels refining capacity are, however, watch-points. Ad-hoc and interventionist approaches to shaping our future energy system will not give the best results. Forced outcomes and unnecessary regulatory barriers should not prevent access to the broadest possible range of competitively-priced energy options, now and in the future.

Australia's domestic energy sources are changing slowly, but coal still provides the largest amount of electricity. It is important that coal is used in a way that produces the most energy for the lowest emissions, but this requires major capital investment in a market that is currently oversupplied. Gas provides a lower emissions source of energy for electricity generation, but in Australia, it is increasingly becoming a more expensive fuel source than coal. Nuclear energy remains a serious consideration for future low emissions energy. Renewable energy will continue to play an important role, especially in regional and remote areas that are off the main electricity grid. The development of large-scale energy storage could be a game-changer for renewable energy, because it can smooth the intermittent supply that typifies renewable energy, and reduces the need for reliable baseload energy from other sources.

Changes in energy technologies can emerge quickly, with the most recent example in Australia being the rapid uptake of solar photovoltaic panels. Australia needs to take advantage of new technologies, many of which will happen overseas, that can contribute to the reliable and affordable supply of energy. New energy sources and technologies increase the flexibility and sustainability of the energy system, as well as helping to lower emissions.

Australia imports much of its transport (liquid) fuels, through well-established supply chains and markets. The country's increasing demand for fuel, combined with reduced domestic refining capacity, needs to be monitored. Increasing cost-competitive domestic production of alternative fuels could diversify the country's liquid fuel supply and strengthen fuel security.

Strong partnerships between government and industry on technology research and development are an important way of ensuring that research investment is well-targeted. This includes governments usefully investing in pre-commercial research and development, as well as the adaptation of international developments to Australian conditions. The challenge is to encourage new technologies without causing unnecessary energy cost increases. Regulatory barriers to the adoption of new energy technologies should also be removed.

Australia has been successfully increasing energy productivity through increased end-use efficiency for decades. This has seen continuing rapid increases in the volume and quality of energy services (lighting, heating, cooling, for example) while the amount of energy needed per service has declined. In more recent years, these trends have contributed to reducing overall electricity use. Consumers can also help support energy security with better energy efficiency, aided by improved information that will help them to use energy cost-effectively.

## The Australian Government's energy policy goals

### Attracting energy resources investment

- Streamline environmental and other approvals to create more certain, timely and accessible approvals. Better regulation will lower costs to business, boost productivity and enhance Australia's international competitiveness.
- Drive better skills and workforce productivity, including access to skilled migration so industry has access to the skills it needs for timely and cost-effective projects, which will encourage future investment.
- Create supply chain opportunities for local small-to-medium enterprises, and create more Indigenous employment opportunities in the energy resources sector.
- Enhance pre-competitive geoscience and improve access to environmental data to lower costs and exploration risk, reduce duplication and regulatory burden, improve community engagement, and better-inform decision-making and environmental management.
- Identify and address infrastructure bottlenecks so industry has access certainty, reducing infrastructure duplication and cost.
- Promote Australia's energy products, technology and services exports to increase the export earnings of Australia's energy resources, products and skills.

### Electricity prices

- Pursue tariff reform and improved consumer access to energy use data, including electricity network tariff reform to limit cross-subsidies. This will help consumers be better informed, and provide tariff choice and options to manage energy use and cost. Energy users will pay their fair share of the costs of the poles and wires that supply electricity.
- Ensure reliability standards do not encourage unnecessary investment in electricity networks so consumers do not receive higher reliability standards than they would be willing to pay for if they understood the impact on electricity prices.
- Improve the efficiency of electricity use to drive electricity cost savings for consumers.
- Rationalise emissions reductions actions to reduce unnecessary costs so consumers do not pay more due to market distortion.
- Remove unnecessary regulatory barriers and market interventions, and encourage further privatisation to create better prices and services for consumers through more competition, efficiency and innovation.

### Building gas supply and improving market operation

- Bring on new gas supply as quickly as possible to avoid potential supply shortages so that domestic gas users do not pay higher prices than necessary.
- Improve the availability and quality of market information to improve market transparency and competition so gas sellers and buyers have more certainty about the availability of supply and pricing.
- Reform gas markets to create more flexible and transparent market arrangements.

### Security, innovation and energy productivity

- Maintain secure, competitively-priced and reliable energy supplies so consumers have access to adequate and reliable energy.
- Improve energy productivity to increase domestic security and reduce greenhouse gas emissions intensity.
- Develop a better 'outlook' capacity so Government is better prepared to respond to supply issues, to global market opportunities, and to invest strategically in research. Industry will have access to better information, giving more certainty and encouraging investment.
- Keep the range of energy options technology neutral by tackling regulatory barriers and making best use of research investments so Australia is able to choose from the broadest possible range of energy options. This will strengthen Australia's energy security.
- Look for relevant international technology engagement to benefit Australian industries from international experience.

# 1 Attracting energy resources investment

## Goals

- **Streamline environmental and other approvals**
  - Outcome: More certain, timely and accessible approvals. Better regulation will lower costs to business, boost productivity and enhance Australia's international competitiveness.
- **Better skills and workforce productivity, including access to skilled migration**
  - Outcome: Industry has access to the skills it needs for timely and cost-effective projects, which will encourage future investment.
- **Create supply chain opportunities and Indigenous employment**
  - Outcome: Local small-to-medium enterprises (SMEs) more involved in supply chains, lowering project costs and growing local economies. More Indigenous Australians employed in the energy resources sector.
- **Enhance pre-competitive geoscience and improve access to environmental data**
  - Outcome: Lower costs and exploration risk. Reduced duplication and regulatory burden. Improved community engagement. Better-informed decision-making and environmental management.
- **Help to identify and address infrastructure bottlenecks**
  - Outcome: Industry has access certainty, reducing infrastructure duplication and cost.
- **Promote Australia's energy products, technology and services exports**
  - Outcome: Increase the export earnings of Australia's energy resources, products and skills.

## Introduction

Australia's large reserves of non-renewable energy resources underpin domestic energy supply and the country's position as a major exporter. Australia is one of the world's major suppliers of coal and uranium, and is the fourth largest exporter of LNG.<sup>11</sup> Australia has the world's largest known uranium resources and the fourth largest coal (black and brown) resources. It also has large conventional and unconventional gas resources and limited resources of crude oil, condensate, and liquefied petroleum gas (LPG). There is potential for increased production and new energy resource discoveries.

Australia embarked on economic reform through the 1980s and 1990s that opened Australia to the benefits of liberalised trade. The resulting stable and liberalised economy contributed to increased capital investment and helped fuel the resources investment of the 2000s. Australia is experiencing enormous economic benefit from the increase in Asian energy demand, and energy resources exports such as coal and gas are integral to a continued strong national economy.

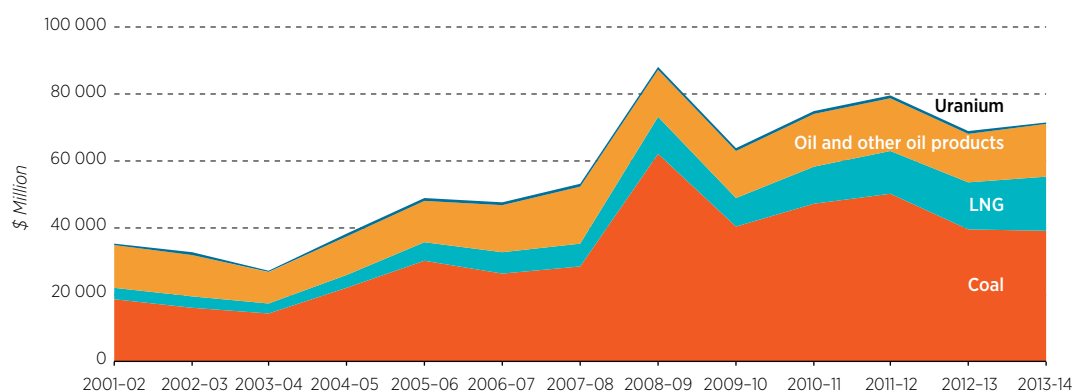
In 2012–13, energy resources were 23 per cent of Australia's exports.<sup>12</sup> Exports are expected to increase, particularly with strong growth in LNG production.

<sup>11</sup> Geoscience Australia and Bureau of Resources and Energy Economics, 2014, *Australian Energy Resource Assessment*, Canberra

<sup>12</sup> Bureau of Resources and Energy Economics, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra

In 2012–13, energy resources exports contributed almost \$69 billion to the Australian economy (Figure 1).<sup>13</sup> Energy related industries contributed nearly \$102 billion (6.7 per cent) to Australia’s gross domestic product in 2012–13.<sup>14</sup>

**Figure 1:** Energy resources export earnings 2001–02 to 2013–14



Source: Bureau of Resources and Energy Economics, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra  
 Note: Other oil products include refinery feedstock, condensate, LPG, bunker fuels and refined petroleum product exports. Data for the June quarter of 2013–14 are Bureau of Resources and Energy Economics forecasts, all other data is historic.

The energy resources sector employed around 123,000 people in 2012–13.<sup>15</sup> Australia is now moving into a period of significant increases in energy resources production. Many of the projects entering the production phase will have long operation lives, supporting exports and employment over an extended period. For example, in the overall resources sector from 2013–2018, while construction jobs are projected to decrease, operations jobs are projected to increase, resulting in only a small reduction in overall jobs in the sector (361,452 to 323,180).<sup>16</sup>

### Potential for future growth

The International Energy Agency (IEA) forecasts strong global energy demand growth to 2035, which will continue to increase worldwide investment in energy production. Demand for energy is predicted to grow strongly: oil by 13 per cent, coal by 17 per cent, natural gas by 48 per cent, nuclear by 66 per cent and renewables by 77 per cent. Global demand will be led by the emerging economies of China, India and South East Asia.<sup>17</sup>

Demand in both domestic and international markets has driven strong growth in the past decade. Between 2002–03 and 2012–13, Australia’s total energy production increased by two per cent a year.<sup>18</sup> The Bureau of Resources and Energy Economics (BREE) forecasts export earnings from energy resources will increase 2.9 per cent to \$71 billion in 2014–15. This reflects higher earnings for LNG, offset by lower coal prices.<sup>19</sup> This increase continues the export growth trend of the past decade. There is strong potential for continued growth in Australia’s energy resources investment.

Coal is one of Australia’s largest energy export resources, forecast to earn \$36 billion in 2014–15.<sup>20</sup> Australia’s success as a coal exporter has been based on being a reliable and competitive supplier. Most of Australia’s coal exports are to Japan, India, China, Republic of Korea, Europe and Taiwan. Coal exports have grown at five per cent a year over the past decade as strong global demand (particularly from China) has stimulated investment in many expansions and new mines and infrastructure.<sup>21</sup> While volume

13 *Ibid*, Bureau of Resources and Energy Economics  
 14 ABS cat no. 5204.0 Australian System of National Accounts  
 15 ABS cat. no. 8155.0 Australian Industry (various issues)  
 16 Australian Workforce and Productivity Agency, 2013, *Resources sector skills needs 2013*, Canberra (These figures are based on AWPAs’s ‘low growth’ scenario for Resources Project Construction. Oil and Gas Operations and Mining Operations figures are based on the ‘base case’ scenario.)  
 17 IEA, 2013, *World Energy Outlook 2013*, Paris (under the new policies scenario)  
 18 Bureau of Resources and Energy Economics, 2014, *2014 Australian Energy Statistics Update*, Canberra  
 19 BREE, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra  
 20 *Ibid*, BREE (includes both thermal and metallurgical)  
 21 BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

is growing, profit is not because of high production costs in Australia, the strong Australian dollar and declining global coal prices. Productivity will be important in this environment.

Australia has the world's largest known uranium resources and is currently the world's third largest producer, having exported 8,391 tonnes at a value of \$823 million in 2012–13.<sup>22</sup> All of Australia's production is exported for peaceful purposes in civil nuclear power stations overseas.<sup>23</sup> Australian uranium exports are controlled by stringent nuclear safeguards with recipient countries.<sup>24</sup> Uranium exports were steady until 2009–10 and then reduced in response to high global prices and reduced demand following the 2011 Fukushima nuclear reactor disaster in Japan. Australia is well-placed to meet projected increases in global demand for uranium with low cost uranium resources, development potential, a strong record as a reliable supplier, and a skilled workforce.

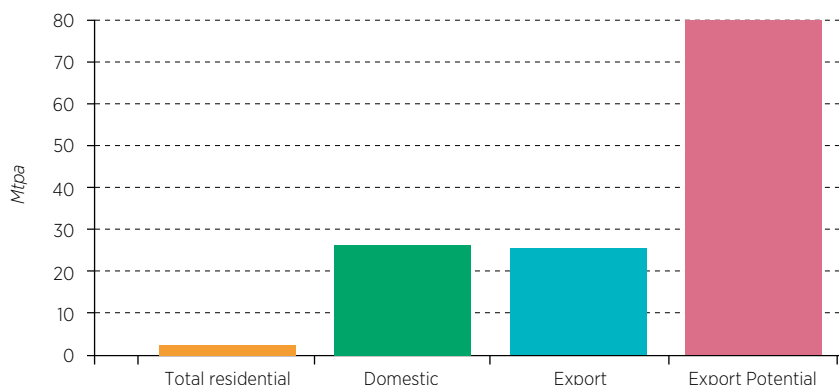
Australia's offshore oil and gas resources management policy has supported large investment in recent years. However, the industry is facing rapid change as oil and gas fields are depleted, and it expands into new frontier areas. Major technological advances are improving the industry's ability to find, define, and develop offshore petroleum resources, but the costs of doing so are also rising.

Australia has three export LNG projects currently running: the North West Shelf Joint Venture processing offshore gas with five LNG trains (liquefaction units at Karratha, Western Australia), and single trains at both the Darwin LNG project (with gas from the Joint Petroleum Development Area with East Timor) and the Pluto project (also at Karratha). These projects have a combined production capacity of over 24 million tonnes a year (Mtpa) (**Figure 2**).

CSG production has been expanding rapidly since it began in 1996 to meet Australia's LNG export commitments. Over one third of eastern Australian gas production is now supplied from CSG. Almost all of this comes from the onshore Bowen and Surat basins in Queensland, with a small proportion from the Sydney Basin in New South Wales.<sup>25</sup>

Almost \$200 billion in capital investment has been committed for new LNG projects across Australia.<sup>26</sup> Projects under construction in the Northern Territory and Western Australia include the Ichthys, Gorgon and Wheatstone conventional onshore LNG projects and the Prelude floating LNG (FLNG) project. The development of three LNG export projects using CSG near Gladstone in Queensland is changing the eastern gas market. Australia is the first country to develop CSG for LNG exports, an experience that has involved innovation from exploration to export. Combined, these developments will lift Australia's LNG export capacity to over 80 Mtpa by 2018 (**Figure 2**).

**Figure 2:** Gas use and export (2012–13), and export potential in 2018



Source: BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

22 BREE, 2014, *Resources and Energy Quarterly, June Quarter 2014*, Canberra

23 Geoscience Australia, 2013, *Australia's Identified Mineral Resources 2013*, Canberra

24 Australian Government, *Australia's Uranium Exports Policy*, [www.dfat.gov.au/security/aus\\_uran\\_exp\\_policy.html](http://www.dfat.gov.au/security/aus_uran_exp_policy.html)

25 Queensland Department of Natural Resources and Mines, 2013, *Queensland's coal seam gas overview*, Brisbane and APPEA, 2013, *APPEA Annual Production Statistics – 2013*, Canberra

26 BREE, 2013, *Resources and Energy Major Projects, April 2014*, Canberra

To secure its share in growing global LNG markets, Australia must remain at the forefront of industry innovation. FLNG allows development of offshore gas resources that would be too costly or remote using traditional land-based LNG. Australia, with Malaysia, is a ‘first mover’ in the commercialisation, service and maintenance of FLNG. FLNG has advantages, including predictable and reduced capital outlays and reduced environmental impact when compared to conventional onshore development.

The Queensland Curtis Island LNG project will start LNG production from late 2014. The Australia Pacific LNG and Gladstone LNG projects are expected to start in 2015. Queensland will benefit from more than \$63 billion in direct investment, almost 30,000 construction jobs, and then up to 17,000 jobs during full production after 2020.<sup>27</sup>

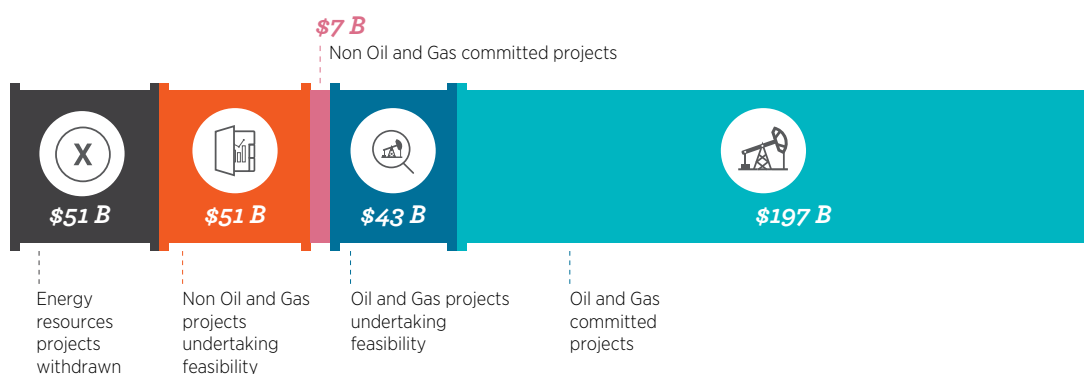
Australia has large renewable energy resources, including wind, solar, geothermal, hydro, wave, tidal and biomass. Since 2010, wind and rooftop solar energy have grown strongly, but geothermal and ocean energy resources remain largely undeveloped. Technology costs have decreased in solar and wind as global production levels increase. The same investment support and lowering of costs do not currently apply to other renewable technologies.

### The current investment pipeline

The estimated value of Australian energy resources projects in the investment pipeline is \$298 billion. The value of committed projects is an estimated \$204 billion, with the remaining \$94 billion in projects at the feasibility stage. Oil and gas projects dominate the investment pipeline at \$240 billion, of which \$197 billion is in committed projects and \$43 billion is in projects at the feasibility stage (**Figure 3**).<sup>28</sup>

The value of energy resources projects in the investment pipeline has peaked and is entering a downturn. This decline reflects the change from the capital-intensive construction phase to the production phase. Between April 2013 and April 2014, there was a \$51 billion decline in the value of projects in the Australian energy resources investment pipeline, from \$348 billion in April 2013.<sup>29</sup>

**Figure 3:** Australia’s energy resources investment pipeline



The investment slowdown is caused by lower resources prices, increased global supply, decreased demand, and rising capital and labour costs. Rising costs relative to other energy resources exporters lowers international competitiveness. The main reason for Australia’s increased costs is the recent unprecedented growth in the global resources sector. Strong demand and high prices for LNG and coal created a business imperative to get them to market as fast as possible, even at the expense of increased running costs.

27 Australian Government Department of Industry and BREE, 2014, *Eastern Australian Domestic Gas Market Study*, Canberra

28 BREE, 2014, *Resources and Energy Major Projects, April 2014*, Canberra

29 BREE, 2014, *Resources and Energy Major Projects, April 2014*, Canberra and BREE, 2013, *Resources and Energy Major Projects, April 2013*, Canberra



Global coal prices have dropped over the past 18 months as global supply increased and demand reduced. This lowered the economic viability of some coal projects. Demand for oil and gas has remained strong, and is expected to continue to be strong in response to high growth in Asia.

## Creating a favourable investment environment

The Australian Government is committed to providing policy stability and certainty as a priority to maximise Australia's ranking as an attractive investment destination.

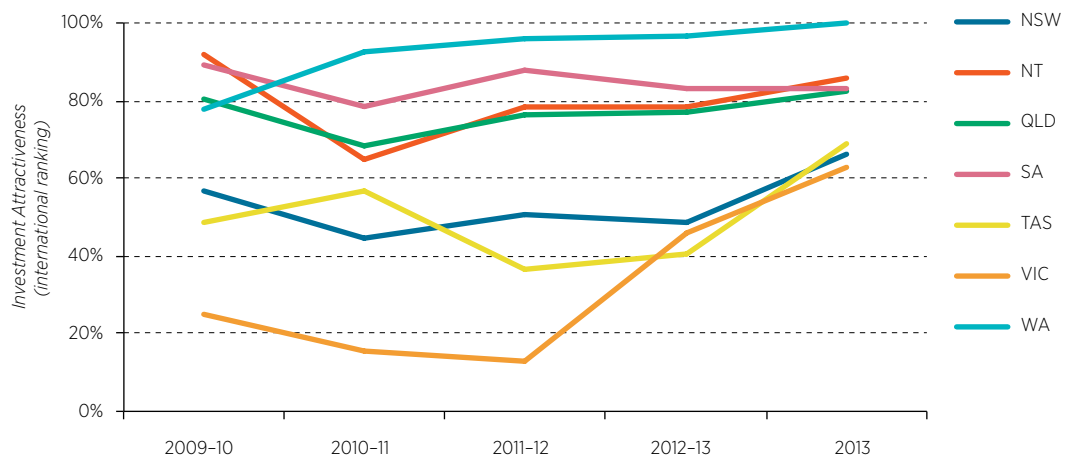
The Fraser Institute undertakes annual surveys of mining, oil and gas companies to assess views on the investment environment in geographic regions.<sup>30</sup> In the 2013 mining survey, Australian states and territories typically ranked in the top 30 per cent (and improving) across most areas, including regulation, fiscal terms, political stability, infrastructure, labour, regulations, trade barriers and land claims. Taxation was the only area where Australia ranked lower than major competitors.

The 2013 mining survey suggests Australia is addressing the concerns of potential investors (**Figure 4**). Australia increased its ranking on investment attractiveness in every state and territory except South Australia. Western Australia was again the highest ranked jurisdiction in Australia and was the most attractive location for investment among the 112 worldwide locations examined in the survey.

The Global Petroleum Survey 2013 shows some concern about investment conditions for gas projects in Australia (**Figure 5**). Australia's ranking decreased on investment attractiveness in every state and territory except South Australia and the Northern Territory.

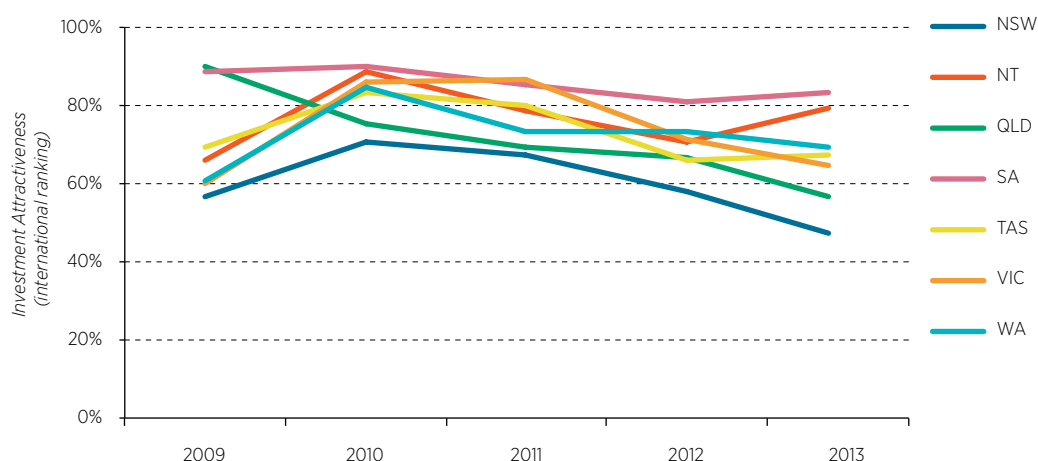
Australian states and territories still ranked well (typically in the top 30 per cent) across most areas, despite their ranking decreasing compared to the previous year. These areas included political stability, fiscal terms, infrastructure and trade barriers. In the areas of labour, regulations, and land claims, the states and territories ranked lower than their major competitors. The national trend over the past three years is a slight decline in investment attractiveness of around six per cent each year.

**Figure 4:** Investment Attractiveness Index — Mining



Source: Fraser Institute, 2014, *Survey of mining companies 2013*, [www.fraserinstitute.org](http://www.fraserinstitute.org)

<sup>30</sup> Fraser Institute, 2014, *Survey of mining companies 2013* and Fraser Institute, 2013, *Global Petroleum Survey 2013*

**Figure 5:** Investment Attractiveness Index — Petroleum

Source: Fraser Institute, 2013, *Global Petroleum Survey 2013*, [www.fraserinstitute.org](http://www.fraserinstitute.org)

The Fraser Institute surveys show Australia is still considered to be a favourable investment destination given its political stability, access to markets and low geopolitical risk. However, results reflect industry concern about regulation and labour costs decreasing global competitiveness, particularly for oil and gas.

It is estimated that Australian LNG projects have been 20 to 30 per cent more costly than those of major competitors in East Africa and North America.<sup>31</sup> High costs reflect the remoteness of major resources projects and the strong Australian dollar. Other factors reported to be contributing to increased costs include:

- Taxation and royalty regimes have changed, including the introduction of the MRRT (which the Australian Government has repealed) and extension of the Petroleum Resource Rent Tax (PRRT). The MRRT applied to iron ore and coal projects, and the extended PRRT applies to both onshore and offshore oil and gas projects.
- The complexity and the number of approvals needed from multiple agencies, often across states and territories, adds time and cost.<sup>32</sup> Major approvals are often subject to conditions and there is concern about the number and the prescriptiveness of those conditions.<sup>33</sup>
- Workforce issues, including labour costs and conditions, and the need for improved access to skilled workers.

Addressing these factors requires a combined effort between governments and industry. In some areas governments need to take the lead, and in other areas it will be industry. Taxation and regulation are two areas for governments to address, with the Australian Government committed to remove unnecessary business costs and barriers to investment.

McKinsey & Company recommend actions to improve competitiveness, including:

- supply chain efficiency to address high costs of rental equipment and freight due to long international supply routes, remote project locations and a small domestic supplier base
- improved industry collaboration to share infrastructure (for example, roads, rail, and ports)
- process improvement, production efficiency, and energy efficiency
- uptake of new technology and management of associated risks.<sup>34</sup>

31 McKinsey & Company, 2013, *Extending the LNG boom: improving Australian LNG productivity and competitiveness*, Perth

32 Business Council of Australia, 2013, *Improving Australia's Regulatory System*, Melbourne

33 Productivity Commission, 2013, *Major Project Development Assessment Processes*, Canberra

34 McKinsey & Company, 2013, *Extending the LNG boom: improving Australian LNG productivity and competitiveness*, Perth

Other actions that could improve competitiveness include:

- improved access to land, considering economic, environmental, heritage and cultural values, and land ownership issues
- better community engagement as local community concerns often delay major developments.

Increased stability and policy certainty will also improve Australia's global competitiveness in exports of energy resources, value-added products, and services. Improvement can also come from better supporting nationally significant project proposals, streamlining approvals and regulation, helping to build skills, and giving access to supporting infrastructure.

## Major issues

### Streamlining regulatory processes

The Australian Government is addressing regulatory issues by:

- removing unnecessary complexity and duplication
- addressing lengthy approval timeframes
- improving regulatory certainty and transparency in decision-making
- removing conflicting policy objectives
- setting clearer principles for land access
- ensuring there is adequate consultation and enforcement.

### Environmental approvals

Streamlining environmental approvals will address duplication in both onshore and offshore approvals in Australian Government processes, and between Australian Government and state and territory processes.

For example, Australian offshore petroleum projects can be subject to a number of separate environmental assessment and approvals processes. The Australian Government regulates petroleum and greenhouse gas activities for Australia's offshore areas (seaward from three nautical miles offshore).

The states and Northern Territory governments are responsible for onshore petroleum operations, and operations as far as three nautical miles offshore (referred to as 'coastal waters').

Offshore petroleum activities across Commonwealth, coastal and internal waters require assessment and approval by:

- NOPSEMA for occupational health and safety, integrity and environmental management
- the relevant state or territory authorities for occupational health and safety, integrity and environmental management
- the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), for activities that are likely to impact on matters of national environment significance.

This situation improved in February 2014, when the Australian Government announced a new streamlined approach for environmental approvals for offshore petroleum and greenhouse gas activities. NOPSEMA is now the sole assessor for these activities in Commonwealth waters. This removed unnecessary duplication and inconsistency, sped up the approvals process, and yet maintained high levels of environmental protection. The streamlined approvals process is expected to result in \$120 million cost savings to industry and community groups.<sup>35</sup>

35 NOPSEMA, 2014, *Strategic Assessment Review Taskforce Single Stage Regulation Impact Statement* (RIS) OBP Reference: 16191, Canberra

*Regulatory inconsistency and duplication could be further addressed by the conferral of state and territory powers to NOPSEMA for occupational health and safety, structural integrity and environmental management in coastal waters, and pursuing the streamlining of environmental approvals in those waters through a strategic assessment process under the EPBC Act.*

Conferral of state and territory powers, along with the accreditation of NOPSEMA as the decision-maker for matters protected under the EPBC Act, would establish NOPSEMA as the single regulator for all offshore oil and gas activities in Commonwealth and coastal waters. This would remove the need for multiple environmental approvals for individual activities and increase certainty and consistency in decision-making.

In May 2014, the COAG Energy Council noted the potential of such an arrangement to reduce the regulatory burden facing resource development projects. South Australia and the Northern Territory agreed to commence discussions with NOPSEMA and the Australian Government on potential conferral of powers in coastal waters. At this stage, the Victorian Government is the only jurisdiction to have conferred its occupational health and safety and structural integrity powers to NOPSEMA.

*The Australian Government has been working with state and territory governments to reduce duplication in the approval processes on land and coastal waters through a 'one-stop shop' for environmental approvals. The 'one-stop shop' will simplify the approvals process, lead to swifter decisions and improve investment certainty.*

*The 'one-stop shop' will be implemented through bilateral agreements with the states and territories under the EPBC Act.*

*Approval bilateral agreements allow a state to conduct a single environmental assessment and approval process that satisfies both state and Australian Government requirements. This means that businesses will only need to deal with one regulator and undertake one assessment and approval process.*

*Memoranda of Understanding to work towards approval bilateral agreements have been signed with all states and territories. Accreditation standards will ensure high environmental standards, transparency and accountability. The Australian Government is working with states and territories on a National Review of Environmental Regulation, building on reforms already underway. The review will identify unworkable, contradictory and incompatible environmental regulation. It will seek opportunities to harmonise and simplify regulations.*

The 'one-stop shop' will achieve major economic benefits, saving businesses around \$420 million a year. The majority of these savings come from reduced approval delays for large projects. Delays to a project can affect project investment decisions and project planning. Reducing delays allows for earlier investment certainty for business and for the full value of a project to be realised.

When other indirect costs are considered, the real savings to business are likely to be even greater. For example, even a small delay in approving a project by the Australian Government can affect seasonal construction opportunities, especially in Northern Australia. This can result in larger delays and lead to larger indirect benefits.

While most states and territories have major project facilitation offices or services in place, the time taken to assess and manage major project approvals varies. Some have streamlined approval processes with defined time periods to speed up major project approvals. In others, sequential processing and long timeframes can slow approvals.

*The Australian Government's Major Project Facilitation Programme provides a single contact point to the Australian Government for eligible proponents. This helps coordinate Commonwealth approvals and develops relationships between the proponent, the Australian Government, and the state or territory government. To access this programme, a project must either significantly boost Australian industry innovation, have significant net economic benefit for regional Australia, or have an estimated investment over \$50 million and make a significant contribution to economic growth, employment, and/or*

*infrastructure. As of September 2014, 16 of 19 projects with major project facilitation status are in the energy and resources sector.<sup>36</sup>*

*The Tasmanian Major Projects Approval Agency was announced in the Australian Government 2014–15 Budget.<sup>37</sup> The agency opened 1 July 2014, and will run for three years. The agency will help streamline Australian Government approvals to speed up the start of major projects in Tasmania. It will focus on projects bringing over \$50 million in new capital to Tasmania by 2020.*

Some projects that increase supply can have large implications for market dynamics because of their timing and location. For example, there are CSG projects in New South Wales, which if progressed rapidly could help counter potential near-term shortages in the east coast domestic gas supply.

The Australian Government could provide technical and administrative help to state and territory governments to progress projects that strategically bolster supply. There would still be a need to ensure the environment is protected, and that community concerns are considered. Where projects have approvals across state and territory boundaries, joint approaches to facilitation could aid timely development.

*Given the importance of some projects, the Australian Government could coordinate and monitor Australian Government and state and territory approval processes. This role could also include recommending improvements to approval processes to achieve better results.*

## Other regulatory requirements

Differences in regulations and standards across states and territories create inefficiencies. For corporations working across states and territories, compliance with different regulatory requirements creates cost burdens. This can occur in areas such as technical standards, safety, training, workforce qualifications, and quality assurance. Recognition of qualifications can also be an issue for workers moving to a different jurisdiction.

State and territory governments recognise the cost and workforce benefits of regulatory harmonisation. The COAG Energy Council has sought to harmonise issues in several areas. The National Mine Safety Framework was set up to develop a nationally consistent legislative framework for mine safety requirements. It will develop consistency between states and territories around access and availability of compliance information, enforcement, and safety performance data reporting and analysis. All states and territories, apart from Victoria, are enacting the framework.

Differences in state and territory regulation for training and workforce qualifications, and associated standards and licensing issues, are an important reform area. In April 2014, the COAG Industry and Skills Council supported a national system of training and qualifications, supported by modern and responsive national regulation.

The resource management regulatory regime for oil and gas developments in Commonwealth offshore waters has served Australia well for half a century. It has resulted in an efficient, dynamic and internationally competitive offshore oil and gas industry that has attracted a large amount of investment, particularly in recent years. However, the challenges of a highly competitive environment for global investment dollars will test the robustness of this regulatory regime. The offshore operating environment is rapidly changing, with rising risks and costs associated with maturing oil and gas fields. There is more focus on exploration and development of new frontier areas in very deep water and far from land and support infrastructure.

*During 2014–15, the Australian Government will review the offshore oil and gas resource management framework applying in Commonwealth waters to ensure it continues to support efficient, innovative and cost-effective commercial exploration and development consistent with the national interest.*

<sup>36</sup> Australian Government Department of Infrastructure and Regional Development, Major Project Facilitation, [www.majorprojectfacilitation.gov.au](http://www.majorprojectfacilitation.gov.au)

<sup>37</sup> Australian Government Budget 2014–15, *Budget measures*, Budget Paper No. 2 2014–15, 13 May 2014, The Treasury

With the world's largest share of economically recoverable uranium reserves (32 per cent), there is a big opportunity for Australia to increase its market share of the global uranium industry.<sup>38</sup>

Work to address issues impacting on Australia's uranium industry reaching its full potential is critical. Environmental assessment of uranium mines could be streamlined and normalised so that the uranium sector is treated the same as other mineral resources. Unnecessary constraints on domestic transport options could be removed to allow access to more ports for export, providing more flexibility, efficiency and cost savings for producers. Noting progress in state jurisdictions in recent years, consideration could be given to any remaining role for the Australian Government in regulating uranium mining and milling operations. Community engagement should build public knowledge on the risk management undertaken by producers.

*The Australian Government will review legislation and programmes that place an unnecessary burden on business.*

## Improving labour productivity and skills

There has been unprecedented capital investment and growth in the energy resources sector over the past decade. The sector is transitioning as major investment projects move from the construction phase to a less labour and capital-intensive production phase.<sup>39</sup>

Between 2002 and 2011, labour productivity within the resources sector fell.<sup>40</sup> Record high commodity prices resulted in a focus on volume rather than efficiency, with profit directly linked to speed to market. Record high prices also encouraged development of more marginal energy resources. In a competitive labour market, there were also instances of long delays in securing workforce agreements for greenfield projects, which added to costs and timelines.

In the past two years, industry has shifted its focus to improving efficiency, in response to lower prices, increased global production, and greater competition. Companies have actively sought to lower input costs by improving labour productivity. In the year to September 2013, labour productivity increased by 7.6 per cent, a significant increase in output in that year.<sup>41</sup>

*The Australian Government has introduced important reforms into Parliament to ensure the negotiating of enterprise agreements for new business development and investment projects do not unduly delay or jeopardise these projects. The changes are most relevant to the resources and construction sector. The Fair Work Amendment Bill 2014 makes provision for:*

- *establishing an optional three month period for negotiating greenfields agreements to cover genuine new enterprises*
- *applying good faith bargaining rules to greenfields agreement negotiations*
- *allowing an employer to take a greenfields agreement to the Fair Work Commission for approval if negotiations are not successfully concluded with a union or unions within three months. The agreement must meet existing approval requirements and, in addition, pay and conditions must be consistent with prevailing industry standards.*

*The Australian Government will also establish new regulatory arrangements to improve labour productivity in the building and construction industry. The Government has introduced legislation to re-establish the Australian Building and Construction Commission (ABCC) to improve the enforcement of workplace relations laws and increase productivity on Australia's building and construction projects, whether onshore or offshore. Given the significant cost of energy resource investments, any ABCC facilitated improvements in workforce efficiency would be expected to deliver important economic benefits.*

38 Geoscience Australia and BREE, 2014, *Australian Energy Resource Assessment*, Canberra

39 Deloitte Access Economics, 2013, *Modelling employment demand and supply in the resources sector – Australian Workforce and Productivity Agency, 5 November 2013*, Canberra

40 Australian Workforce and Productivity Agency, 2013, *Resources Sector Skills Needs 2013*, Canberra

41 PricewaterhouseCoopers, 2013, *Productivity scorecard December 2013*, Canberra

*A Productivity Commission Review of the Fair Work Act 2009 will analyse the workplace relations system and its impact on the economy, productivity and jobs. The Government will consider the Productivity Commission's findings, and if there is a good case for sensible and fair changes, they will be taken to an election before being implemented.*

The change from the construction to the production phase of major projects will affect job numbers and required skills. The number of construction jobs will decrease and the production phase workforce will increase. While some skills are common across both phases, most are not. The change is expected to result in a 10 per cent drop in demand for trade workers and labourers, and a seven per cent increase in managers and professionals. This trend is more acute in the oil and gas sector. Of the projected 22,268 new employees needed over the next five years, almost 55 per cent (12,579) are managers or professionals.<sup>42</sup>

The Resources Sector Skills Needs report was released in December 2013. The study provides an integrated approach to workforce development to supply skills through both training and skilled migration initiatives.<sup>43</sup> Jointly developed by industry and government, the study addresses workforce needs.

Softening of the labour market has eased widespread shortages, particularly in the coal mining industry. Critical shortages for the oil and gas sector are projected to continue for some years because of the highly skilled nature of oil and gas production. The demand for skills is likely to outstrip the capacity of the training system.<sup>44</sup> To address this, the industry will need to work in partnership with training providers to increase training capacity.

*The Australian Government is proposing to work with the oil and gas sector to examine skills issues (for example, recurring and long-term workforce needs and their policy implications) with the aim of making the Vocational Education and Training (VET) system more responsive to industry.*

Australian governments have measures in place to help industry to meet their current and future workforce needs. These include higher education and the VET system, which targets developing workforce skills and competencies for specific qualifications.

*The VET System is being reviewed for its efficiency and effectiveness in delivering the skill needs of Australian industry. The COAG Industry Skills Council has agreed on three VET reform priority areas:*

- *examine the standards for providers and regulators to ensure they better recognise the different level of risk posed by different providers*
- *enable the regulators to deal more effectively with poor quality to improve confidence, and meet the Australian Government's deregulation objectives*
- *reduce the burden on the VET sector arising from constant updates to training packages, streamline governance arrangements and committees, and ensure that industry is involved in policy development and oversight of VET sector performance.*

Better linkages between enterprises and training organisations are the most effective way of addressing specific industry workforce demands. This can improve the productivity and competitiveness of businesses, and ensures Australian workers develop skills that are in demand. Some companies are already developing partnerships with education providers and setting up in-house training and quality arrangements. A partnership approach results in Australian workers receiving nationally recognised qualifications and skill sets. This has long-term benefits for the whole sector through improved workforce mobility. Better information exchange between the Australian Government and states and territories would develop more effective national regulation and policies, and better designed government support.

<sup>42</sup> Australian Workforce and Productivity Agency, 2013, *Resources Sector Skills Needs 2013*, Canberra

<sup>43</sup> *Ibid*, Australian Workforce and Productivity Agency

<sup>44</sup> *Ibid*, Australian Workforce and Productivity Agency

Some companies have chosen to develop their own in-house training programmes, independent of the VET system, focussing on their specific skilling needs. They indicate that this targeted training, while not necessary linked to a specific qualification, is more responsive to their needs and delivers a better work outcome. This raises the question as to whether the current VET focus on skills and competencies to meet specified qualifications is meeting industry's needs. This issue is one area where greater industry engagement in the design and delivery of training, as nominated by the COAG Industry Skills Council, is an essential part of improving outcomes.

Funding arrangements also need to be responsive to industry needs so that public funding delivers training outcomes that are valued by industry, and ensures positive employment outcomes and improved industry competitiveness.

*The Australian Government's new Industry Skills Fund will encourage the flexible delivery of training necessary to improve industry competitiveness.<sup>45</sup> The Australian Government is also supporting the states and territories' implementation of contestable funding models. These models are designed to improve the flexibility and responsiveness of the system.*

There is broad industry and government support for temporary work (skilled) visas. Subclass 457, labour agreements, Enterprise Migration Agreements, and Designated Area Migration Agreements all help fill skills shortages that cannot be filled domestically in a short timeframe.

*The Australian Government has conducted an independent review of integrity in the subclass 457 programme. The panel has made a number of recommendations to improve integrity, reduce the impost on business, and improve processing. The Government is currently considering the recommendations.*

Feedback from industry through this process is that they would like to see the repeal of the 2013 changes to the 457 programme that required initial domestic labour market testing. Concerns are the changes impede quick access to the right skills for a productive workforce because of complexity, red tape and cost. Enterprise Migration Agreements were developed as part of the National Resources Sector Workforce Strategy.<sup>46</sup> With the expected increase in the gas industry's workforce needs, the need for an agreement structure that supports large resource sector and infrastructure projects remains strong.

Some resource companies have argued for greater streamlining of requirements for intercompany transfers. Many resources companies have an international presence, and more Australian employees gain experience working overseas than overseas employees do by working on Australian projects. The 457 review is considering how this requirement can be better supported.

*The Australian Government is improving Agreement processing by:*

- *streamlining negotiation provisions*
- *publishing guidelines for greater transparency and certainty*
- *using application forms to lead businesses more easily through requirements*
- *introducing better consistency in requirements (training thresholds, for example) across the temporary skilled migration pathways.*

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<sup>45</sup> Australian Government Department of Industry, Industry Skills Fund, [www.business.gov.au/skills-and-training/Pages/Industry-Skills-Fund](http://www.business.gov.au/skills-and-training/Pages/Industry-Skills-Fund)

<sup>46</sup> Australian Government Department of Industry, 2013, *National Resources Sector Workforce Strategy: Addressing the skills and workforce needs of the resources sector - December 2013*, Canberra



## Create supply chain opportunities and Indigenous employment

### Small-to-medium enterprise opportunities

SMEs can use their skills and capabilities to help meet future workforce needs. Innovative supply chain solutions and outsourcing should be part of any workforce strategy. For SMEs to build successful alliances with energy resource projects, they need to have both relevant skills and companies that will let them enter their supply chains.

The Australian Government has worked with SMEs to develop their readiness to enter supply chains by providing them with the tools and capabilities that improve their business acumen. Assistance typically includes strategic business planning, marketing, project management, and financial and human resources. An emphasis is placed on productivity improvements.

The Australian Government recently announced the Entrepreneurs' Infrastructure Programme, which will focus on supporting industry in a range of areas, including improving the capability of small business, such as by connecting them to the research sector.<sup>47</sup> SMEs should play a key role in any science and technology strategy. This will provide small business with high-level leadership on practical strategies to improve their capability and competitiveness, and better link them to opportunities in major energy and resources projects.

The Australian Government's Single Business Service is streamlining the way businesses access industry information, grants and services by putting their needs first, reducing red tape and providing quality, consistent services at the lowest possible cost. This whole-of-government service assistance is available to all Australian businesses, made up of a consolidated online presence accessible anytime and anywhere, a contact centre and a face-to-face business facilitation network to link interested businesses with relevant programmes and services. Practical support includes information for businesses that is easy to find and understand, tailored advice for businesses when they choose to access it, direct links to services provided in the Entrepreneurs' Infrastructure Programme, and seamless connections with other Australian Government programmes or services such as the Research and Development (R&D) Tax Incentive and the Industry Skills Fund.

*The Australian Government is committed to making it easier for business to deal with government. The recently announced \$484.2 million Entrepreneurs' Infrastructure Programme will help Australian energy companies by providing them with structural and strategic support to capitalise on growth opportunities within the sector. The programme will support the commercialisation of good ideas, job creation and lifting the capability of small business, providing market and industry information, and facilitating access to business management advice and skills from experienced private sector providers and researchers. Once fully operational the programme will offer streamlined and better-aligned delivery of training and support to Australian businesses.*

*The Australian Government's Industry Skills Fund will also support the training needs of SMEs, not readily met by the national training system. Target industries will include mining, oil and gas, and mining equipment technology and services.*

### Indigenous employment and business opportunities

Resource projects in regional areas with a high Indigenous population offer opportunities to boost Indigenous employment and businesses by developing local labour forces and service providers. Many of these jobs are in the supply chains for major projects.

Resource companies have shown a commitment to provide more opportunities for Indigenous engagement in their workforce through initiatives such as the Generation One Australian Employment Covenant. The Employment Covenant has gained commitments from employers for over 62,000 jobs for Indigenous Australians.<sup>48</sup> Many of these are in the resources industry. Resources companies have also participated in the work between the Minerals Council of Australia and the Australian Government designed to increase Indigenous employment and enterprise development opportunities in mining regions.

<sup>47</sup> Australian Government Budget 2014–15. *Budget measures, Budget Paper No.2 2014–15, 13 May 2014*, The Treasury.

<sup>48</sup> [www.generationone.org.au](http://www.generationone.org.au)

There are barriers to engaging Indigenous Australians in employment or business opportunities. These barriers arise from poorer outcomes for Indigenous people in education, limited work histories, poor health, and increased contact with the criminal justice system. A flexible and collaborative approach with early and sustained consultation between Indigenous peoples, industry, communities and government is needed to overcome such barriers and realise future opportunities.

*The Australian Government's recently announced Indigenous Advancement Strategy includes the Jobs, Land and Economy Programme. The programme aims to get adults into work, foster Indigenous business and help Indigenous people to produce economic and social benefits from effective use of their land, particularly in remote areas. The new programme is part of the Australian Government's commitment to streamlining arrangements, reducing red tape and prioritising spending to achieve practical outcomes on the ground.<sup>49</sup>*

*The Australian Government has been trialling an Indigenous engagement model for Indigenous SMEs that are working or seeking to engage in the energy and resources sectors. The trial has identified several barriers to entry. Partners in these projects include Woodside Energy, Chevron, Anglo American, Arrow Energy and Santos. The Government will continue to identify supply chain opportunities for Indigenous SMEs and initiatives that respond to the needs of employers and Indigenous communities.*

*Andrew Forrest was commissioned by the Government in October 2013 to chair a comprehensive review of Indigenous training and employment services. The review was released in August 2014. The 27 recommendations made in the review are wide-ranging and aim to create parity between Indigenous and other Australians. In addition to Indigenous training and employment, the recommendations also target pre-natal care, early childhood services, school attendance, welfare, VET, Indigenous land reform, and housing and mobility. The Government is carefully considering the review's findings and will respond to the recommendations following a public consultation and feedback process.*

## Better geoscience and community engagement

### Geoscience to encourage exploration

Australia's sedimentary basins are underexplored and petroleum titles cover only 20 per cent of Australia's offshore basins. National pre-competitive geoscience leverages private investment by lowering exploration risk. For example, government investment in new geoscience in the Bight Basin totalled \$6.1 million, and has leveraged \$1.2 billion of work programme commitments (**Box 1**). Expanded pre-competitive geoscience is needed to leverage exploration investment in Australia's remote offshore regions.

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<sup>49</sup> Australian Government Department of Prime Minister and Cabinet, Indigenous Affairs Budget 2014-15, [www.dpmc.gov.au/accountability/budget/2014-15/IA\\_budget](http://www.dpmc.gov.au/accountability/budget/2014-15/IA_budget)

**Box 1:** Geoscience Australia's Energy Security Programme

Geoscience Australia's \$134 million Energy Security Programme (2006–2011) applied state-of-the-art surveying technologies in pre-competitive geoscience to identify prospective greenfield areas for onshore and offshore Australia. Opening of the Great Australian Bight as a potential new energy province was a key success. This included work programme commitments of \$1.2 billion to explore hydrocarbons. Seismic surveying resulted in discovering a previously unknown sedimentary basin (Millungera Basin) with potential for multiple energy commodities in North Queensland. Geoscience Australia's use of airborne geophysical surveys in Western Australia, Northern Territory and South Australia resulted in greater industry uranium exploration capability. Current work programme priorities at Geoscience Australia include sophisticated geochemical techniques to develop a comprehensive map of petroleum-source rocks in greenfield areas across both onshore and offshore Australia. Geoscience Australia is also exploring ways to use the world's most sophisticated research drilling vessel, Chikyu (owned by the Japanese Government) to add key geological knowledge for remote offshore areas through the drilling of stratigraphic wells.

Source: Geoscience Australia

Geoscience Australia, with states and territories, prepares high-quality public information on Australia's energy resources, including pre-competitive geo-scientific data. Offshore companies also collect a wide range of marine data to meet legislative requirements. Geoscience Australia's proposed National Offshore Petroleum Information Management System will allow more efficient use of petroleum data submitted by industry. Only industry offshore seismic and well data are submitted to central repositories under legislation.

Geoscience Australia, with state and territory agencies, continues to assess Australia's onshore oil and gas prospectivity. This will provide better information on the location and resource potential of unconventional oil and gas. Geoscience Australia's geological survey activities with state and territory agencies for further greenfield development could be expanded.

Centralised management and open access of industry environmental data submitted for approval and regulatory purposes would give industry the benefit of larger and better managed data sets. It would also reduce, in the long-term, data collection costs for industry, as is the case with seismic and well data. Improved data would also better inform government regulation, environmental oversight, and management of national assets.

Centralising marine data management would have specific benefits for the offshore oil and gas industry through access to consistent, robust environmental data to:

- increase the transparency of government decisions to the public and industry
- expand the available evidence base for prediction of environmental impacts and risks, decision-making and environmental management
- streamline data management, delivery and analysis
- improve the national marine information base
- reduce regulatory burden on industry and government through open access to a common set of marine environmental data
- improve national oil spill planning and response
- contribute to assessing cumulative impacts, in line with recommendations from the Montara Commission of Inquiry, the Hawke Review of the EPBC Act, and the Oceans Policy Science Advisory Group.<sup>50</sup>

50 Australian Government Oceans Policy Science Advisory Group, *A Marine Nation: National Framework for Marine Research and Innovation*, March 2009, Melbourne

The 2014 Supplementary Report to the NOPSEMA Strategic Assessment noted that collection and access to data would reduce industry baseline information costs and provide more sophisticated data for assessing environmental impact and risks.<sup>51</sup> Proposed new measures in this area are included in this chapter in response to the report.

## Information for community engagement

Community engagement on the relative merits of resources projects, particularly those involving CSG and large coal mining developments, would also benefit from improved environmental and scientific data. Community concerns relating to some resources projects highlight the need to better engage local communities as early as possible during the planning and development process.

Better engaging communities means genuine contact, and having trusted project impact information available. This information needs to cover environmental, social and economic issues. The main responsibility for engaging communities rests with industry. Governments look for appropriate community engagement as a normal part of their approval and regulatory roles.

Governments also have a role in environmental assessment and monitoring, and supporting relevant research. Information from environmental monitoring, such as vegetation and ground water mapping, is an important part of assessing environmental impacts. Information from government and other trusted institutions can give communities confidence in the integrity of the information used to make decisions. Research on processes used in resources projects and their impacts helps to understand how to reduce adverse effects of projects. Government leadership can include setting clear research priorities.

*The Australian Government is strengthening the science underpinning regulatory decisions on the water-related impacts of CSG and large coal mining development through the Independent Expert Scientific Committee on Coal Seam Gas and Large Mining Development that provides advice to Australian Government and state and territory regulators, and by funding bioregional assessments and other research.*

*Bioregional assessments are science-based studies that will develop detailed, multi-layered records of the ecology, hydrology, geology and hydrogeology in a particular geographic region. The bioregional assessments are analysing the potential direct, indirect and cumulative impacts of CSG and large coal mining development on water-related assets. Products include compilations of relevant data, descriptions of coal resources, conceptual models, outputs of numerical and analytical models, and impact and risk analysis.*

*Research projects will address key knowledge gaps in the consideration of water-related impacts from CSG and coal mining. The priority areas of research are hydrology, ecology, chemicals and cumulative impacts. The research includes a project which is assessing the risks to human and environmental health from chemicals used in drilling and hydraulic fracturing in CSG extraction in Australia*

*The National Plan for Environmental Information Initiative aims to improve the quality and accessibility of environmental information. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Environmental Information Systems initiative is designed to convert data from environmental information systems, services, and tools into objective-based information and knowledge.*

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<sup>51</sup> Australian Government Department of Industry and NOPSEMA, 2014, *Streamlining offshore petroleum environmental approvals – Supplementary Report*, Canberra

## Identifying and addressing infrastructure constraints

The cost of getting energy resources to population centres and export facilities affects return on investment. As extraction is often in remote areas, transport infrastructure is particularly important.

Shared use of private infrastructure is challenging, but duplication through not sharing is costly and reduces national competitiveness. Self-funded infrastructure can be a commercial advantage, and private interests are understandably reluctant to lose that advantage.

The final report of the Productivity Commission review of the National Access Regime released in 2014 recommended keeping the National Access Regime to share private infrastructure. The access regime is important because of the large amount of privately owned energy resources infrastructure. The Commission also recommended that facility-based arrangements should be limited to where there is a clear net benefit from tailoring access regimes for a specific facility. New industry-specific regimes should only apply where there is sufficient similarity between infrastructure services within the industry, and where the industry has features that justify different regulatory treatment from that offered by the generic National Access Regime.<sup>52</sup> The Australian Government will respond to this report after the Competition Policy Review is complete.

In 2013, Infrastructure Australia identified reforms needed to boost infrastructure performance and capital productivity to “...ensure Australia moves away from a project-by-project view of infrastructure development and focuses on big picture national priorities.”<sup>53</sup>

The July 2014 Productivity Commission report on Public Infrastructure identified the need for reform of the assessment and development of public infrastructure projects.<sup>54</sup> The Productivity Commission urged reform of the governance and institutional arrangements. The aim is to promote better decision-making in project selection, funding, financing and delivery of infrastructure services.

COAG reforms over the past decade have tried to improve the transparency, consistency and predictability of infrastructure planning. They have also tried to provide a less constrained investment environment. Governments have made significant progress on harmonising regulation, access regimes, and competitive tendering. It has been possible to develop national ports and land freight strategies, and address capacity constraints (notably in ports) and financing obstacles.

*The Australian Government is investing \$50 billion across Australia over seven years to deliver vital transport infrastructure for the 21<sup>st</sup> century. This should leverage additional infrastructure investment in excess of \$125 billion when combined with expected state and territory government, and private sector funding.*

*To develop a national view on infrastructure priorities and policies to ensure better value for money and deliver Australia's future infrastructure needs, the Government has tasked Infrastructure Australia to:*

- *undertake five yearly evidence-based audits of Australia's infrastructure asset base*
- *develop a 15 year infrastructure plan*
- *evaluate proposals for nationally significant economic infrastructure, as well as proposals in the education and health sectors.*<sup>55</sup>

<sup>52</sup> Productivity Commission, 2013, *National Access Regime*, Inquiry Report No.66, Canberra

<sup>53</sup> Infrastructure Australia, 2013, *National Infrastructure Plan: June 2013 Report to COAG*, Sydney

<sup>54</sup> Productivity Commission, 2014, *Public Infrastructure*, Inquiry Report No.70, Canberra

<sup>55</sup> Australian Government, 2014, *Budget 2014-15, Building Australia's Infrastructure*, Canberra

Evaluations will be required for projects receiving more than \$100 million in Australian Government funding. Infrastructure Australia will be expected to publish its findings.

In June 2014, the Australian Government passed amending legislation to the *Infrastructure Australia Act 2008* aimed at strengthening Infrastructure Australia's role as an expert advisor to governments through a change in its governance structure and through better clarification of its functions.

*In May 2014, all states and territories signed up to a National Partnership Agreement. Under the agreement, money from public asset sales will be recycled for productivity-enhancing infrastructure such as new roads, ports and rail projects. The sales and long-term leases will leverage a further 15 per cent federal funding to June 2019, if the sale proceeds are reinvested into new infrastructure. States and territories have two years to reach agreement with the Australian Government on the assets sold and projects undertaken. Privatisations could include the sale of energy and resources related transport assets. This includes electricity generation, transmission and retail businesses, as well as ports or water assets. The incentive payments will only be available for five years through to 30 June 2019.*<sup>56</sup>

The COAG Transport and Infrastructure Council is mapping nationally significant road and rail freight routes to develop a better understanding of the national land freight and logistics system. The mapping is an example of the work needed for long-term certainty for industry, and to inform planning and investment processes. These maps will also be critical for identifying funding need and corridor protection measures for key freight routes.

In 2013, Infrastructure Australia reviewed the nation's gas and electricity infrastructure. It found that the infrastructure broadly meets needs, but given some over-investment in electricity networks, is not always efficient. Infrastructure Australia also noted current and proposed regulatory reforms could make needed improvements. These include the recent reform to allow broader continuing assessments of investments to ensure they are efficient and/or necessary.<sup>57</sup>

## Promoting exports

Australia has excellent research capacity and skill in energy technology and services. The demand for Australia's resources and expertise in energy equipment and technology services will grow as economies such as China and India develop and more people have access to electricity. By linking Australia's innovative energy services businesses with supply chains, Australia can increase productivity and high-value exports. Examples of potential exports include micro-grid solutions and off-grid renewable energy systems, renewable energy forecasting, and systems to extract coalmine methane for electricity generation or other uses. Australia could take advantage of being a first mover in FLNG through service and maintenance exports. Australia can also provide skills for the changing energy market and respond to the global demand for energy services.

Energy exports contribute to Australia's economic growth. To continue this growth, Australia will need to expand its offerings to evolve with global energy markets. Opportunities for value-added products flow from the energy resources export base. For example, there are proposals to add value to Australia's large brown coal resources by converting it to a black coal equivalent and producing chemicals and fuels, including hydrogen. Coal to liquids (CTL) technology is one way to add value to coal, and could be applied to Australia's black and brown coal. The Australian Government, together with the Victorian Government, is funding demonstration projects to convert brown coal in the Latrobe Valley to more valuable products through the Advanced Lignite Demonstration Program.<sup>58</sup> These products include fertiliser, synthetic crude oil and high-value coal used for steel making.

The Australian Government, through Austrade, advances Australia's international trade and investment interests by providing information, advice and services. Austrade's energy sector focus includes oil and gas, mining equipment, technology and services.

<sup>56</sup> Australian Government, 2014, *Budget 2014-15, Building Australia's Infrastructure*, Canberra

<sup>57</sup> Infrastructure Australia, 2013, *State of Play 2013*, Sydney

<sup>58</sup> State Government Victoria, Department of State Development, Business and Innovation, Advanced Lignite Demonstration Program, [www.energyandresources.vic.gov.au/energy/innovation-and-research/energy-technology-innovation/advanced-lignite-demonstration-program](http://www.energyandresources.vic.gov.au/energy/innovation-and-research/energy-technology-innovation/advanced-lignite-demonstration-program)

*Austrade will continue to promote sector investment. Austrade has also appointed a new, dedicated Senior Investment Specialist to work with industry and government to manage investment opportunities in the energy and resources sectors.*

*The Australian Government will also establish a Consulate-General in Houston, United States of America, to maximise the two-way trade and investment opportunities of the United States energy revolution.*

The Australian Government has demonstrated its commitment to enhance trade. In April 2014, the country's largest trade mission ever visited North Asia and saw the conclusion of the recently-signed Free Trade Agreement (FTA) with Japan and the signing of the Korea–Australia FTA. The Australian Government is also prioritising a FTA with China, and already has an FTA with the United States. This means Australia will soon have FTAs with all four of its top trading partners. FTAs can lead to more competitive Australian exports, cheaper imports for local businesses and less red tape for foreign investors. For example, all of Australia's energy resources exports to Japan and Republic of Korea will eventually be duty free under the new FTAs.

*As part of this mission, the Australian Government held the first Australia Week in China (AWIC), which showcased Australia's strengths across a number of sectors, including mining equipment, technology and services. The Australian Government will provide \$2 million for the next AWIC event in 2016.*

*The Australian Government has provided \$200 million in capital to the Export Finance and Insurance Corporation (EFIC), which provides export related services to help Australian exporters and investors access overseas markets.<sup>59</sup> In the past, just under half of EFIC support has gone to the mining and mining services sector.<sup>60</sup>*

Another key driver of growth and investment is developing a collaborative culture, particularly between research and industry. Collaboration increases investment by building a critical mass and increasing the spread of knowledge between businesses. Investment is needed to translate research and science into commercial and economic results. Industry and government collaboration has opened export opportunities for Australia's mining equipment and technical services sector, with \$27 billion of products and services exported in 2011–12. In the same year, these often niche businesses employed around 386,000 people. These businesses are more innovative, rating higher on measures of innovation than other Australian businesses and spending \$1.2 billion in research and development in 2011–12.<sup>61</sup>

*The Australian Government is developing an Industry, Innovation and Competitiveness Agenda. The agenda will focus on initiatives to promote national competitiveness and productivity, including options to encourage innovation and collaboration between research and industry.*

<sup>59</sup> Australian Government Budget 2014–15, *Budget measures, Budget Paper No.2 2014–15, 13 May 2014*, The Treasury

<sup>60</sup> EFIC 2013, *Annual Report 2012–13*, Canberra

<sup>61</sup> Austmine 2013, *Australia's New Driver for Growth*, Sydney

## Feedback sought

**The Government seeks comments on ways the Goals set out at the beginning of this chapter could be achieved.**

Below is a brief summary of the actions outlined in this chapter that the Australian Government is either currently pursuing, or which are proposed, to achieve the Goals in this chapter.

- **Streamline regulatory processes**

*The Australian Government is committed to ensuring environmental decisions are made as efficiently as possible.*

*The Australian Government has accredited NOPSEMA as the regulator for offshore petroleum activities under the EPBC Act. It is now working to extend this accreditation to coastal waters in states and territories that confer their regulatory powers to NOPSEMA. These activities will reduce duplication, complexity, cost and the time taken for environmental and other approvals.*

*The Australian Government supports new major projects through its Major Projects Facilitation Programme. It has also established a Major Projects Office in Tasmania to assist with Australian Government approvals. A national office to monitor and benchmark various approvals processes is also a possibility.*

- **Improving labour productivity and skills**

*The Australian Government will improve labour productivity through the introduction of greenfields provisions in the Fair Work Act 2009. It will also undertake a more general Productivity Commission review of the Act, and re-establish the powers of the ABCC.*

*The Australian Government is working with industry and the states and territories to reform the VET system.*

*Foreign workers complement locally available skills. The Australian Government will improve Migration Agreement processing and review the integrity of the subclass 457 visas.*

- **Create supply chain opportunities and Indigenous employment**

*The Australian Government has introduced the Entrepreneurs' Infrastructure Programme and Industry Skills Fund. The programmes will encourage investment and local business development.*

*The Australian Government will support local supply chains through the Entrepreneurs' Infrastructure Programme. It will also encourage Indigenous business engagement and employment, considering the findings of the Forrest Review.*

- **Better geoscience to encourage investment and assess impacts**

*The Australian Government has a pre-competitive geoscience program. It is also improving access to land and marine environmental information to speed up, and reduce the cost of, environmental impact assessments.*

- **Identifying and addressing infrastructure constraints**

*The Australian Government is committing \$50 billion to transport infrastructure. It is encouraging states and territories to privatise their assets through the Asset Recycling Initiative, and recycle funds into new infrastructure projects. The Australian Government is also carrying out periodic reviews to identify infrastructure bottlenecks.*

- **Promoting exports**

*The Australian Government is promoting energy exports and attracting investment in new technologies by appointing a Senior Investment Specialist in Austrade.*



## 2 Electricity prices

### Goals

- Pursue tariff reform and improved consumer access (including controlled third party) to energy use data, including electricity network tariff reform to limit cross-subsidies
  - Outcome: Consumers are better informed, have tariff choice and know how to manage energy use and cost. Energy users pay their fair share of the costs of the poles and wires that supply electricity.
- Ensure reliability standards do not encourage unnecessary investment in electricity networks
  - Outcome: Consumers do not receive higher reliability standards than they would be willing to pay for if they understood the impact on electricity prices.
- Improve the efficiency of electricity use
  - Outcome: Electricity cost savings for consumers.
- Rationalise emissions reductions actions to reduce unnecessary costs
  - Outcome: Consumers do not pay more due to market distortion.
- Remove unnecessary regulatory barriers and market interventions, and encourage further privatisation
  - Outcome: Better prices and services for consumers through more competition, efficiency and innovation.

### Introduction

Electricity prices have recently risen sharply, with household prices rising by around 50 per cent nationally over the past four years (**Figure 6**). This price rise mainly reflects investment in poles and wires (both new and replacement of aged infrastructure) to meet anticipated rising peak demand and ensure reliable supply to customers by replacing ageing assets. The carbon tax and other environmental policies, such as the Renewable Energy Target (RET) and state feed-in-tariffs, have also had an impact. In 2013-14, environmental schemes were projected to make up around 16 per cent of the national average electricity price, compared with network costs of 52 per cent.<sup>62</sup>

By developed world standards, Australia has enjoyed stable and competitively-priced electricity for many years. However, the way electricity is generated, managed and used in Australia has recently changed. Demand is falling and more electricity is coming from distributed generation, mainly from residential solar photovoltaic (PV) rooftop systems. Better tariff choices are available, supported by improved metering, which provides more information for consumers on cost and use. New energy technologies, such as battery storage, also have the potential to cause further change.

Australian electricity policy is overseen by the COAG Energy Council, which is chaired by the Australian Government and includes energy Ministers from the states, territories and New Zealand. A timeline of regulatory changes in electricity markets is at **Attachment 2**.

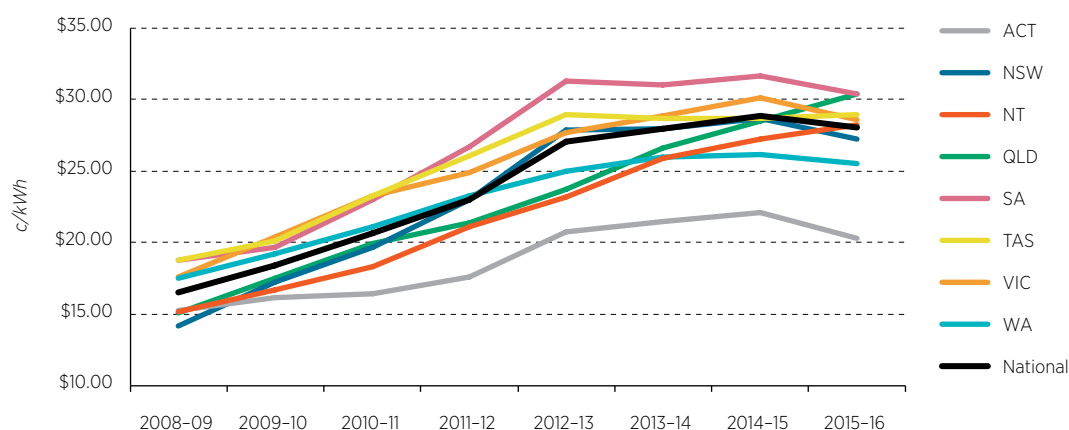
Australia's largest electricity market, the National Electricity Market (NEM), supplies Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia and Tasmania. The three institutions that govern this market are the national regulator (Australian Energy Regulator – AER), the rule maker and market development body (Australian Energy Market Commission – AEMC) and the operator (Australian Energy Market Operator – AEMO).

62 Australian Energy Market Commission, 2013, *2013 Residential Electricity Price Trends report*, Sydney

The COAG Energy Council will undertake a review of governance arrangements for energy markets. The review is expected to consider the performance of current governance arrangements for energy markets, and provide advice to the Council on potential areas of improvement to the institutions and their oversight by the Council.

The South West Interconnected System and North West Interconnected System supply most of the electricity demand in Western Australia. The Darwin Katherine Interconnected System supplies most of the electricity demand in the Northern Territory. Australia also has several smaller grids to service regional and remote areas that are not connected to these main systems. At this stage, the electricity systems in Western Australia and the Northern Territory operate independently, and there is little prospect of interconnection with eastern states' systems due to distances and costs involved.<sup>63</sup>

**Figure 6:** Trends in retail electricity prices by jurisdiction, 2008-09 to 2015-16



Source: AEMC, 2013, *Residential Electricity Price Trends*, Sydney

Many consumers have greater variability in their energy demands due to appliances such as air-conditioners and flat screen televisions. These can place more demand on the electricity system, particularly in peak demand during extreme weather such as heatwaves. Managing peak demand is an important issue for an electricity market, especially with declining average consumption. Many consumers have reduced their overall demand on the electricity network, through both energy efficiency and residential generation.

The average demand in the NEM has been falling since 2009. However, high temperature events during mid-January 2014 in South Australia and Victoria showed that peak demand in the NEM remains at a similar level to previous maximums.<sup>64</sup>

Peak demand (which only occurs for about 40 hours a year, equivalent to less than one per cent of the time) drives investment in network capacity. Network costs account for around 38 to 59 per cent of retail electricity bills.<sup>65</sup> Investment to meet expected future peak demand therefore has a major impact on electricity bills.

Electricity price increases, improved technology and better-informed consumers have created the setting for more innovative retail tariffs and better consumer engagement. Most Australian households have access to tariff choices, but have been slow to move from the common simple two-part structure. This simple tariff consists of a fixed connection charge and a variable consumption charge. The basic nature of most residential meters, and historical low-level of consumer interest and awareness, are behind this slow uptake. Regulated prices, where they continue, have also muted price signals as an incentive to alter use in response to tariff choices.

<sup>63</sup> AEMO does provide gas retail contract and market administration services in Western Australia, via the Retail Energy Market Company (REMCo).

<sup>64</sup> AEMO, Price and Demand, [www.aemo.com.au/Electricity/Data/Price-and-Demand](http://www.aemo.com.au/Electricity/Data/Price-and-Demand)

<sup>65</sup> AEMC, 2013, *2013 Residential Electricity Price Trends report*, Sydney

There is a price-disconnect between the wholesale and retail electricity prices, and consumers remain unaware of the actual cost of their consumption around wholesale pricing and the impact on the network. Wholesale electricity prices follow a predictable pattern during the day, being higher in the morning and early evening. There are also predictable seasonal patterns, in summer and winter. If retail prices reflected the cost of wholesale electricity and network costs at the time of use, consumers would likely change their pattern of use in response to these price signals. Providing price signals to transfer energy use from high cost peak demand periods to lower cost off-peak periods also minimises the need for investment in extra network capacity.

Continuous reform in the electricity sector since the early 1990s has resulted in better outcomes for consumers. However, there is increasing concern that reform has slowed. The pace of reform needs to accelerate to provide downward pressure on further price rises. Work is needed to help small customers transition to a competitive retail market. Improving the information available to customers on new energy products and services will assist.

Reliability standards are in place to protect consumers from outages. Unnecessarily high standards may encourage inefficient investment in networks. Standards should reflect user willingness to pay for avoiding outages and timeliness of restoration from outages.

Following large rises in 2012–13, recent determinations of the regulated electricity retail price increases for 2013–14 were reduced to below four per cent in New South Wales, Tasmania and the Australian Capital Territory. Queensland was the exception, where prices rose by 20.4 per cent as the network businesses sought to recover network investment following the Queensland Government's price freeze in the previous year.<sup>66</sup>

The Australian Government supports the disaggregation and privatisation of government-owned electricity assets. Energy services that are contestable, efficient and well-governed reduce business costs that are ultimately paid for by consumers. The Australian Competition and Consumer Commission (ACCC) reviews the sale of large infrastructure businesses to ensure that market competition and energy consumers are not disadvantaged by such transactions.

The Australian Government has repealed the carbon tax, convened an independent panel to review the RET, released the panel's report and recommendations, and will soon announce its response to the report. To stimulate change within the electricity sector, the Australian Government has also committed to:

- drive state and territory tariff reform through the COAG Energy Council so customers pay a cost that more closely reflects their individual use of the system
- support the sale of state and territory owned electricity assets through the Asset Recycling Initiative as a way to make energy services more contestable and efficient
- introduce the Emissions Reduction Fund (ERF) to encourage increased uptake of energy efficiency.

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<sup>66</sup> AER, 2013, *State of the Energy Market*, Melbourne

# Major issues

## Inflexible pricing arrangements

### Tariff structures

The AEMC Power of Choice review of 2012 found that consumers are often not faced with electricity network tariffs that accurately reflect the variability of the costs of supplying and delivering their electricity. In fact, most households and SMEs do not face cost-reflective (for example, 'time-of-use') network tariffs. Most consumers have a flat or inclining block pricing. These are flat tariffs with a step change beyond a certain level of usage, but not time varying. These flat tariffs do not charge consumers according to time varying wholesale and network costs associated with their time of consumption. These consumers are limited in their ability to reduce costs by changing their electricity use patterns. To address this, the AEMC is working on several electricity market rule-change requests.<sup>67</sup>

Flat network tariff arrangements that do not reflect the impact of energy users on the network result in significant cross-subsidisation among consumers. Those consumers who have lower energy use during peak times, and therefore lower impact on network costs, are subsidising those that have higher peak energy use. An example of this is the use of air-conditioners, used more during peak periods (on hot days). Electricity utilities need to ensure the poles and wires that deliver electricity have the capacity to deliver at these times. As a result, the growth in air-conditioner use has led to more network investment, recovered through electricity bills from all energy users, not only air conditioner users. The Productivity Commission report on network regulation estimated the cross-subsidy for customers with air-conditioning was around \$350 a year.<sup>68</sup>

Price signals sent by cost-reflective tariffs will give consumers greater choice, and a better understanding of the charges they face. Cost-reflective tariffs send consumers signals to transfer their energy use from high cost peak demand periods to lower cost off-peak periods. Deregulation of retail prices for smaller customers in Victoria and South Australia and uptake of market contracts in some other states and territories have added to the incentives to alter patterns of use.

The AEMC's draft determination on proposals to amend distribution network pricing arrangements is an important first step toward more cost-reflective tariffs.<sup>69</sup>

*The Australian Government will build on the AEMC rule changes by working directly with states and territories. Goals include more cost-reflective tariffs, a competitive environment for metering, and better uptake of smart metering.*

### Advanced metering

As well as effective price signals, consumers will need the real-time energy use information from advanced metering, such as exists in Victoria. This helps consumers better understand their energy use and respond to price signals. In many states and territories, the limited residential metering currently in place could not support cost-reflective and flexible tariffs.

The Victorian Government mandated the roll-out of smart meters, which, coupled with the privatisation of Victoria's energy businesses, has created more innovative market offers and tariffs. Victoria now has the highest proportion of households on some form of time-of-use tariff. Other states and territories are making metering services competitive to support voluntary uptake of smart meters where the benefits outweigh the costs.

Residential smart meters are one part of smart grid technology. Together with smart sensors installed in local substations, they have been trialled for their ability to use energy and existing electricity infrastructure more productively, and improve energy reliability.

67 AEMC, Power of Choice, [www.aemc.gov.au/Major-Pages/Power-of-choice](http://www.aemc.gov.au/Major-Pages/Power-of-choice)

68 Productivity Commission, 2013, *Electricity Network Regulatory Frameworks, vol 2*, Canberra

69 AEMC, 2014, *Distribution Network Pricing Arrangements, Draft Rule Determination, 28 August 2014*, Sydney

A smart grid can improve the reliability of electricity services for consumers by identifying and resolving faults on the electricity grid, better managing voltage, and identifying infrastructure requiring maintenance. Smart grids can also help consumers better manage their individual electricity consumption and costs through the use of ‘smart appliances’ to manage use at peak times and pricing structures to encourage energy use outside peak times. They are also better able to accept large volumes of decentralised and renewable energy than conventional grids.

The final report of the Smart Grid, Smart City project found smart grids, together with better tariffs and customer feedback technologies, have the potential to provide more than \$27 billion in net benefit to Australia.<sup>70</sup>

*The Australian Government supports access to smart meters and other technologies for consumers who want them, as they empower consumers to lower their bills. The Australian Government is pursuing ongoing energy market reform to put the maximum downward pressure on electricity bills.*

*The AEMC is considering a rule change to support competitive metering services outside Victoria. This will encourage the metering needed for flexible tariffs, stimulate investment in advanced metering technology, and promote innovation in energy services.*

*The COAG Energy Council has requested AEMO provide further advice on minimum functionality for smart meters by October 2014, and a shared market protocol for smart meter communications by February 2015.*

*Building on existing activities, the Australian Government will work on a solution to improve consumer energy data access, seeking to give consumers instant online access to their energy data, reducing barriers to service providers offering innovative decision tools.*

## Network costs

There has recently been unprecedented growth of distributed generation, mainly rooftop PV with solar panels now on more than 1.2 million roofs.<sup>71</sup> State and territory premium feed-in-tariffs, and small-scale technology certificates under the RET led to initial uptake. Moves away from premium tariffs to fair and reasonable feed-in-tariffs, and small-scale certificates reducing to a ‘one-for-one’ basis under the RET have slowed but not stopped the growth in household generation. Rapidly falling PV prices, combined with the trend of higher electricity prices, have led to continued uptake. If storage costs continue to fall, some consumers with their own generation may choose to disconnect from the network to avoid network fees.

Networks need to manage variable output from distributed generation to keep voltage stable. Distributed generators can unpredictably stop producing and create a surge in demand for network electricity. Distributed generators can also start producing more and create a surge in supply and voltage fluctuations. Improving forecasts of solar resources, similar to existing wind forecasting, would help predict output from distributed generation.

Some analysts have found that consumers without distributed generation currently subsidise those who do have it.<sup>72</sup> Households with distributed generation often use less, and therefore pay less for, supplied network electricity, but still use the network for back-up supply and to distribute excess electricity into the grid. The cost of the network they use is affected by the size of the network needed to connect them. Their output is often low at times when peak demand is high, meaning they only purchase electricity when it is at its most expensive to supply. This subsidy is on top of direct subsidies that distributed generation owners may receive, such as solar feed-in-tariffs.

This leaves other consumers to pay more per unit of energy to cover the fixed costs of the network, which have not changed, in addition to any feed-in-tariffs. Over time, prices may continue to increase if total demand continues to drop while peak demand remains high.

<sup>70</sup> Arup, Energeia, Frontier Economics, Institute for Sustainable Futures (University of Technology Sydney), 2014, *Smart Grid, Smart City: Shaping Australia's Energy Future National Cost Benefit Assessment, July 2014*, Sydney

<sup>71</sup> Clean Energy Regulator, 2014, Small-scale installations by postcode, [ret.cleanenergyregulator.gov.au/REC-Registry/Data-reports](http://ret.cleanenergyregulator.gov.au/REC-Registry/Data-reports)

<sup>72</sup> Grattan Institute, 2014, *Fair pricing for power*, July 2014, Melbourne

The Future Grid Forum has shown that cost-reflective electricity prices, energy efficiency and demand side (consumer) participation are the most effective measures to put downward pressure on electricity prices. Additionally, the Forum scenarios have highlighted a transition of Australia's electricity system to a far more distributed system (where up to 46 per cent of electricity is from distributed generation).<sup>73</sup>

Demand side participation can reduce energy use during peak times, and lower consumer energy costs through lower wholesale market prices. It can also reduce local peak demand in areas of network under capacity pressure, and remove, reduce or postpone the need for investment in new network infrastructure to ensure the reliable supply of electricity.

The COAG Energy Council is carrying out a series of demand side reforms to address key recommendations from the AEMC's Power of Choice review. These reforms are designed to support demand side participation in the NEM and will contribute to efficient investment in, as well as operation and use of, electricity services. The demand side measures include competitive metering, cost-reflective network pricing, improving consumer energy data, an improved demand management incentive scheme, and improved demand forecasting.

*The AEMC has released its draft determination on proposals to amend distribution network pricing arrangements to improve the price signals consumers receive based on the costs they impose on the network.<sup>74</sup> Reform will support the unwinding of existing cross-subsidies, and provide incentives for consumers to reduce their energy use in high cost peak demand periods. This will lessen the need to invest in network expansion to meet growth in peak demand. The AEMC also aims to require distributors to be transparent on network pricing, and to consult with stakeholders when developing network prices.*

*The Australian Government looks forward to the AEMC's final rule determination on Distribution Network Pricing Arrangements. The Australian Government will consider the determination and whether it suitably addresses cross-subsidies in consumer payments for network costs.*

*The COAG Energy Council will conduct a scenario-based assessment of the challenges and risks facing Australian electricity networks over the next two decades, testing the adequacy of the current economic regulatory framework. The findings will be considered in mid-2015.*

## Some consumers have particular circumstances

Many customers are now making the move to retail market contracts, as they learn that regulated prices do not always mean lower bills. In most states and territories households have the ability to shop around for an energy market contract that sets the price, terms and conditions most suitable to their needs.

Depending on their electricity consumption and where they live, a consumer could have saved 5–16 per cent by switching from a standing offer to a market offer in 2012–13.<sup>75</sup>

Many consumers still struggle to determine which deals best suit their energy needs. There are trusted government information sources such as the AER's 'Energy Made Easy' website, which includes an energy price comparison tool.<sup>76</sup> The COAG Energy Council is also working to better understand what information and resources will best support consumer needs in the future, including that provided by industry and governments.

Some consumers are not in a position to change their electricity consumption patterns in response to price signals. For example, a low-income household on an energy rebate or concession scheme required to stay on a standing offer tariff. Other examples reflect personal or business need, such as people on 24-hour-a-day medical equipment, and agricultural businesses such as irrigators where the time of electricity use is not flexible. Both the pattern of daily use and overall use will affect the cost implications of cost-reflective tariffs on such consumers.

<sup>73</sup> CSIRO, 2013, *Change and Choice – The Future Grid Forum's analysis of Australia's potential electricity pathways to 2050*, Canberra

<sup>74</sup> AEMC, 2014, *Distribution Network Pricing Arrangements, Draft Rule Determination, 28 August 2014*, Sydney

<sup>75</sup> AEMC, 2013, *2013 Residential Electricity Price Trends report*, Sydney

<sup>76</sup> Australian Government Australian Energy Regulator, Energy made easy, [www.energymadeeasy.gov.au/compare-offers](http://www.energymadeeasy.gov.au/compare-offers)

The National Energy Customer Framework provides important protections to consumers in hardship in the Australian Capital Territory, New South Wales, South Australia and Tasmania, including rules on customer repayment plans.<sup>77</sup> Also, electricity retailers are required through government-imposed community service obligations to help vulnerable consumers with concessions and rebates. These obligations vary by state and territory. Industry and consumer advocates have already undertaken early research on how community service obligations should respond to changed tariff design.

Low income earners, particularly in remote Indigenous communities, have mixed experiences with electricity pricing. Issues include the ability to pay bills, as well as variations in the way electricity is priced. Some remote communities pay normalised power prices, some make 'contributions' to power costs that are irregular, and many others make no contribution at all. In contrast, some small communities, generally those that are family-run, are fully responsible for their own electricity supply.

Customers in regional and remote areas have different issues to those located in major cities and towns. Despite recent network upgrades to replace ageing infrastructure and improve reliability, many regional areas still have limitations on the reliable supply of electricity. Regional communities often perceive that they have limited ability to engage in electricity planning and regulatory development.

Some communities are at the end of long transmission lines where reliability is lower than in urban areas. These communities can face regular 'brown-outs'. For example, far north Queensland is on the end of the NEM where transmission lines carry electricity long distances from generators in central and northern Queensland. Transmission losses as high as 50 per cent before electricity reaches these communities have been cited.<sup>78</sup> Subsidies are often applied so that customers pay only for electricity received, instead of the amount dispatched. Industrial customers in these locations do not receive subsidies and pay the full cost of supply.

Limited supply and low reliability can restrict the economic potential of some regional and remote areas located on the fringe of the grid. However, improvements require large investment in infrastructure, putting upward pressure on prices for all network customers. Alternative sources of energy supply to off-grid remote Indigenous communities can reduce reliance on diesel generation or network expansion and provide opportunities for economic development and employment. Greater use of distributed energy generation sources (such as wind, solar and hydro), combined with demand management, can help address some of these issues for regional and remote communities.

*The Australian Government will provide \$10.6 million over four years as part of the Outback Power measure to service up to 250 existing renewable energy systems. These will be in remote Indigenous communities in Western Australia, Queensland, and the Northern Territory.<sup>79</sup>*

Asset privatisation is a concern to communities in some regional areas where there is limited competition. There are also cost and equity issues to consider for regional areas.

*Energy Ministers have recognised the need for a more strategic and long-term approach to national advocacy for energy consumers. They have agreed to establish a national energy consumer advocacy body (Energy Consumers Australia) by 1 January 2015. The body will work in cooperation with all stakeholders, including industry and energy consumer advocates, on national energy market matters of strategic importance or material consequence for energy consumers, in particular for residential and small business customers.*

*The COAG Energy Council will continue to develop the proposal to increase the consumer voice in national energy market matters, particularly household and small business consumers.*

77 AEMC, Guide to application of the NECF, [www.aemc.gov.au/Energy-Rules/Retail-energy-rules/Guide-to-application-of-the-NECF](http://www.aemc.gov.au/Energy-Rules/Retail-energy-rules/Guide-to-application-of-the-NECF)

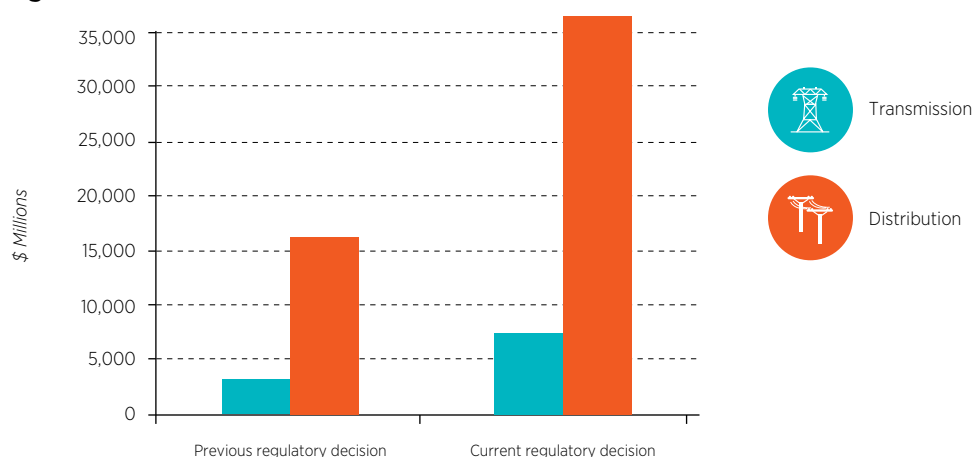
78 2014, Far North Queensland Regional Organisation of Councils, Submission to the Energy White Paper Issues Paper, Cairns

79 Australian Government Budget 2014-15, *Budget measures, Budget Paper No.2 2014-15*, 13 May 2014, The Treasury

## Reliability standards should reflect consumer demand

The AER assesses each NEM network business' forecast of the revenue it needs to cover costs and make a suitable return. These determinations are done on a five-year regulatory cycle. This removes the risk of monopoly pricing in networks and encourages efficient investment in NEM infrastructure. Network investment over the current regulatory cycle (beginning between 2009 and 2013 for various network businesses) is expected to be over \$7 billion for transmission and \$36 billion for distribution. This represents an increase on the previous regulatory cycle of around 16 per cent for transmission and 60 per cent for distribution (**Figure 7**).<sup>80</sup> However, recent determinations have pointed towards network costs being less of a cause for price increases.

**Figure 7:** Network investment



Australia's recent trend in reduced grid-based electricity use was not evident at the time electricity networks developed their last regulatory proposals for the current five-year regulatory cycle. The long-term forecasts for peak demand indicated a continuing upward trend, based mostly on the increasing use of air conditioners. The decrease in average electricity consumption since those forecasts has resulted in further under-utilised network infrastructure outside of peak demand periods.

Some states and territories are responsible for setting their own network reliability standards, and network investment in recent years has replaced ageing assets to address reliability during peak demand.<sup>81</sup> However, customers may not have been willing to pay for such high reliability standards if they understood the impact on electricity prices. In late 2013, the AEMC published its Review of the National Framework for Distribution Reliability and Review of the National Framework for Transmission Reliability. The reviews recommended greater efficiency, transparency and community consultation in how reliability levels are set and provided across the NEM.<sup>82</sup>

The COAG Energy Council is finalising the National Framework for Electricity Network Reliability for consideration at its next meeting in December 2014. Once agreed, states and territories will report to COAG on their progress on adoption. The COAG Energy Council has tasked AEMC with developing common definitions for distribution reliability measures. It also tasked the AER with determining the value customers place on reliability to inform reliability requirements for the five-year regulatory cycle, beginning in mid-2019.

*Recommendations from the COAG Review of the National Frameworks for Distribution and Transmission Reliability are being implemented through the COAG Energy Council. Priority recommendations could be accelerated, depending on agreement from states and territories.*

<sup>80</sup> AER, 2013, *State of the Energy Market 2013*, Melbourne

<sup>81</sup> Productivity Commission, 2013, *Electricity Network Regulatory Frameworks*, Canberra

<sup>82</sup> AEMC, the Review of the National Framework for Distribution Reliability, 27 September 2013 AEMC, the Review of the National Framework for Transmission Reliability, 1 November 2013



## Electricity can be used more efficiently

While cost-reflective electricity tariffs can help to reduce peak use through price signals, other non-tariff measures to reduce costs are available through an increasing range of innovative new services. Energy efficiency technologies, for example, help consumers reduce their energy use. These cost savings could increase if consumers had the price incentives, information and tools to support better energy efficiency.

For households, energy efficiency measures include improved building standards, appliance efficiency standards, and awareness programmes. There is scope to improve the national harmonisation of such initiatives, with the Victorian, New South Wales, and South Australian governments having introduced their own energy efficiency schemes in 2009. These initiatives vary in design. Under Victoria's Energy Efficiency Target and the New South Wales Energy Efficiency Scheme, retailers surrender and trade in certificates to meet a target. The South Australian Residential Energy Efficiency Scheme requires energy retailers to provide incentives for household energy reduction. Victoria has announced it is closing its scheme because of rising costs.

Other measures can include smart energy management tools or voluntary programmes. These include remote access load control of 'smart appliances', such as air conditioners and pool pumps, to reduce electricity use at times of critical peak demand in exchange for price incentives, such as discounts. The benefits of this approach extend to all electricity users due to the reduced investment in networks to service peak demand.

SMEs are often time-poor and require decision support tools that are tailored to their businesses. These tools should allow SMEs to better understand their options to reduce electricity bills, such as by taking part in demand aggregation.

Demand aggregation allows consumers to reduce their bills by pooling their demand with that of other consumers, thereby creating a larger-sized electricity purchase that is eligible for discount.

Large commercial and industrial users are more likely to have the ability to manage their energy consumption. This is because of better metering, energy management processes, strong internal cost controls, and access to in-house skills and resources. For these users, price signals should encourage the effective management of energy use.

The former Energy Efficiency Opportunities Program demonstrated potential savings that could be achieved through energy efficiency, however, the benefits need to outweigh compliance costs. Measures to improve energy productivity should not introduce an unnecessary layer of regulation or additional compliance costs.<sup>83</sup>

Australian Government actions to improve energy efficiency more broadly are described in **Chapter 4**.

## Rationalise emissions reductions schemes

Several emissions reduction schemes are on-market interventions (such as feed-in tariffs and the former carbon tax). These directly affect wholesale or retail prices and cause market distortions that increase prices. Many such schemes are being phased out. The Australian Government will continue to work with states and territories to reduce the impact of such interventions on the efficient operation of energy markets.

*The Australian Government will consider the findings of the independent review of the RET in the context of the costs and benefits of the scheme, the impact on electricity prices and markets, and sovereign risk issues.*

<sup>83</sup> Australian Government Department of Industry 2013, *EEO Program - The First Five Years: 2006-11*, Canberra

There has been concern expressed that some emissions reductions actions are poorly targeted, add red tape, and push up the cost of electricity. The RET review highlights the interconnectedness of energy and emissions reduction policies, and the need to harmonise them.<sup>84</sup>

*The Australian Government could develop principles for the COAG Energy Council to determine the market impact of on-market interventions. Impacts include energy consumption, price, investment and ability to deliver emissions reductions. COAG could periodically receive reports on market interventions and their impact.*

## Unnecessary regulatory barriers should be removed

Through the 2004 Australian Energy Market Agreement, states and territories committed to streamline and improve the quality of economic regulation across energy markets. Improved regulation reduces cost and complexity for investors, enhances certainty, and lowers barriers to competition.

In some states and territories the government can be both an asset owner and policy maker. This has led to commentary suggesting that those governments may have allowed too much investment without due regard for the cost to consumers.<sup>85</sup> The Productivity Commission notes that government owned network businesses have conflicting objectives that reduce their efficiency and undermine the effectiveness of incentive regulation. Their privately owned counterparts are better at efficiently meeting the long-term interests of their customers.<sup>86</sup> Being both owner and standards-setter distorts market signals for efficient investment and can result in adverse results for the consumer.

*In March 2014, the Australian Government set up a new agreement with states and territories for the Asset Recycling Initiative. The initiative will introduce new incentive payments for states and territories that make progress on privatisation by selling their assets and redirecting the funds into productive infrastructure. The Australian Government will provide the states and territories incentive payments of 15 per cent of the value of the government owned assets sold and reinvested into new infrastructure. States and territories have two years to reach agreement with the Australian Government on the assets sold and projects undertaken. The incentive payments will only be available for five years through to 30 June 2019.<sup>87</sup>*

Historically, Australia's electricity assets and businesses were largely owned by state and territory governments. Governments structurally separated the electricity supply industry in the 1990s into its competitive (generation and retail) and monopoly (transmission and distribution) sectors.

More recently, retailers and generators have vertically integrated to form 'gentailers', which allows them to internally manage price volatility in the wholesale market. This smooths the impact of price fluctuations on their business. Views vary as to whether vertically integrated energy businesses create barriers to entry for other generators and retailers, and reduce competition.

The level of vertical integration varies across jurisdictions. Victoria has significant vertical integration with major retailers controlling 52 per cent of generation capacity. Victoria's other major generators, GDF Suez Australian Energy and Snowy Hydro, jointly supply around 12 per cent of electricity through their respective retail businesses.<sup>88</sup>

Government owned generators also have some vertical integration. The Western Australian Government recently remerged the state's electricity retailer and generator into one vertically integrated entity. The generator Snowy Hydro owns retailer Red Energy, which operates in New South Wales, Victoria and South Australia, and recently announced the purchase of the retailer Lumo. The generator Hydro Tasmania owns generation and a retail business, Momentum Energy. The Queensland and Tasmanian governments own joint distribution-retail businesses and the Australian Capital Territory Government has a 50 per cent share in ActewAGL, which is an energy retailer and distributor.<sup>89</sup>

84 Warburton, D, Fisher, B, In't Veld, S, Zema, M, 2014, *Renewable Energy Target Scheme report of the Expert Panel*, Canberra

85 Grattan Institute, 2012, *Putting the customer back in front - How to make electricity cheaper*, December 2012, Melbourne

86 Productivity Commission, 2013, *Electricity Network Regulatory Frameworks*, Canberra

87 Australian Government, 2014, *Budget 2014-15, Building Australia's Infrastructure*, Canberra

88 AER, 2013, *State of the Energy Market*, Melbourne

89 AER, 2013, *State of the Energy Market*, Melbourne

Under the *Competition and Consumer Act 2010*, the ACCC is responsible for ensuring market competition, including the approval of proposed mergers and acquisitions.

*In December 2013, the Australian Government announced the first comprehensive review of Australia's competition laws and policy since the National Competition Policy Review (The Hilmer Review) was undertaken in 1993. The Competition Policy Review will examine the broader competition framework to ensure it continues to be a significant driver of productivity improvements, that current laws are working as intended and that they are effective for all businesses, big and small.*

*The review will examine whether key markets (including utilities) are competitive and whether changes to the scope of the Competition and Consumer Act 2010 and related laws are necessary to enhance consumer, producer, supplier and retailer opportunities in those markets and their broader value chains.*

Reduced electricity use is lowering the wholesale price for electricity. Wholesale prices are also lower because renewable energy generation has a lower running cost, with its higher capital costs subsidised by the RET. The impact of these lower prices affects thermal generators (particularly gas-fired generators) the most, due to their higher running costs. However, falling demand has not yet led to substantial permanent decommissioning of thermal generation capacity.

Some coal-fired generators may be unwilling to close, despite running at a loss. This is because there is uncertainty about the actions of their competitors, and the potential for improved market conditions in future. They may also be concerned about the high redundancy and rehabilitation costs involved. Generators may seek to cut operational expenses by deferring scheduled maintenance to remain in business until prices improve, possibly resulting in lower reliability. The repeal of the carbon tax may improve the competitive position of coal-fired generators.

If demand continues to fall and wholesale electricity prices remain low, there is little incentive for investment in new large-scale generation capacity beyond projects supported by the RET. AEMO forecasts that no new generating capacity will be needed in the NEM until at least 2023–24.<sup>90</sup> While this is not an immediate issue, the process to build a new plant can take many years.

COAG set up the NEM with a wholesale spot price that provides the necessary signals to inform investor decisions to enter or exit the market. However, this signal may not be working efficiently because of other unnecessary regulatory influences.

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<sup>90</sup> AEMO, 2014, *Electricity Statement of Opportunities*, Melbourne

## Feedback sought

The Government seeks comments on ways the Goals set out at the beginning of this chapter could be achieved.

Below is a brief summary of the actions outlined in this chapter that the Australian Government is either currently pursuing, or which are proposed, to achieve the Goals in this chapter.

- **Increase the range of tariff choices**

*The Australian Government is working with states and territories on electricity pricing so users pay the real cost of electricity based on the time at which they use it, as well as their fair share of the costs of the poles and wires. Consumers (or their chosen third party representatives) need easy access to their energy use data through improved metering capability (smart meters) to enable time-of-use pricing. The Australian Government is waiting for an AEMC rule change on the distribution of costs of electricity networks.*

- **Reliability standards should reflect consumer expectations**

*The Australian Government is working with states and territories to establish a framework for setting reliability standards that take into account the value consumers place on reliable electricity supply. However, individual energy consumers have limited opportunity to engage in electricity market policy and planning. Therefore, the COAG Energy Council is setting up Energy Consumers Australia to provide for effective consumer advocacy.*

- **Improve the efficiency of electricity use**

*See Chapter 4*

- **Rationalise emissions reductions schemes**

*Government interventions in energy markets have proven to be an expensive means of achieving environmental outcomes. The Australian Government could seek COAG agreement to a set of principles for interventions to ensure they are cost-effective.*

- **Remove unnecessary regulation and encourage privatisation**

*The Australian Government has established the Asset Recycling Initiative, which will introduce new incentive payments for states and territories that make progress on privatisation by selling their assets and redirecting the funds into productive infrastructure. The Australian Government is also undertaking a comprehensive review of competition laws and policy.*

*The Australian Government could investigate whether there are any unnecessary regulatory barriers preventing exit of surplus generation capacity.*

## 3 Building gas supply and improving market operation

### Goals

- **Bring on new gas supply as quickly as possible**
  - Outcome: Avoid potential supply shortages so that domestic gas users do not pay higher prices than necessary.
- **Improve the availability and quality of market information to improve market transparency and competition**
  - Outcome: Gas sellers and buyers have more certainty about the availability of supply and pricing, and the market is more transparent and competitive.
- **Implement other gas market development priorities to expedite gas market reform**
  - Outcome: A development strategy for the unconventional gas industry. More flexible and transparent market arrangements.

### Introduction

Industry uses gas for electricity generation and in industrial, mining and manufacturing processes. Residential and commercial uses include space heating, cooking and transport. Australia has three distinct and geographically isolated domestic gas markets: the eastern, western and northern.

Three bodies govern Australia's gas markets, overseen by the COAG Energy Council. They are the AEMC (rule making and market development), AEMO (day-to-day operation and administration of the wholesale and retail markets in all jurisdictions except Western Australia and the Northern Territory) and the AER (regulation of transmission and distribution infrastructure except Western Australia). The AER also has some retail responsibility through the National Energy Customer Framework. Western Australia has its own energy market and regulatory framework. There, the Economic Regulation Authority is the regulator and the Independent Market Operator sets the rules and operates the market and the Gas Bulletin Board in Western Australia (**Attachment 2**).

All Australian gas markets have existing or emerging links to export markets, through the rapid growth in LNG projects. Australian gas production has historically been from conventional gas resources, but exploration and development of CSG has increased rapidly in recent years. CSG currently represents 12 per cent of national production, accounting for 34 per cent of Australia's eastern market production. Development of other unconventional gas resources (shale gas, tight gas, deep CSG) across Australia remains at an early stage, but shows strong potential.<sup>91</sup>

Early work to define shale gas resources is most advanced in eastern Australia, and the Cooper and Eromanga basins are the focus of much exploration and appraisal. In October 2012, Santos announced the first commercial production of shale gas from the Cooper Basin in South Australia. Estimates of the potentially recoverable shale gas resources range up to 290,000 Peta Joules (PJ). This figure is across eight basins in central and south-east Australia, around half of which are in the Cooper Basin.<sup>92</sup> Put in context, 2012–13 gas consumption in eastern Australia was 854 PJ.<sup>93</sup>

91 BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

92 Cook PJ, Beck V, Brereton D, Clark R, Fisher B, Kentish S, Toomey J and Williams J, 2013, *Engineering energy: unconventional gas production*, Australian Council of Learned Academies, Melbourne.

93 BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

The Australian east coast domestic gas market has historically enjoyed low prices, although Australian domestic prices will be increasingly influenced by higher costs of production and export price parity (minus liquefaction and transport costs). These effects will be most obvious in the eastern market.

The potential for a near-term supply shortage in the eastern market is largely due to the start of LNG exports from Queensland. Decisions to restrict the development of CSG supply in New South Wales and Victoria have added to this problem.

There are no 'quick fixes' for the potential near-term supply shortage and price pressures facing gas users. Most stakeholders agree that increasing gas supply will help reduce upward pressure on gas prices, but higher domestic prices are nonetheless inevitable.

Increasing gas supply relies on addressing community concerns and removing unnecessary regulatory barriers, although gas resource development must still be subject to necessary environmental and community safeguards. Trusted geo-scientific information on CSG impacts will help better engage communities in decision-making.

A more transparent and flexible gas market would help relieve consumer uncertainty about availability and pricing, and also improve price competition. The COAG Energy Council gas market reform programme will deliver improvements that will build on progress already made in transparency and price discovery, such as the new Wallumbilla Gas Supply Hub market in Queensland. The Australian Government will continue to work with state and territory governments and industry on market development to provide mechanisms for understanding likely future prices, and any associated risk management.

The Australian Government notes calls for domestic gas reservation policy and national interest tests. Such actions will not address current challenges in the market, and may result in negative long-term outcomes by deferring future investment. Instead, more competitive markets need better market information, informed community participation, operational transparency, and accelerated project development.

## Eastern market

The eastern market was the subject of a recent Australian Government review, the Eastern Australian Domestic Gas Market Study. The eastern market is the largest domestic gas market in Australia, connecting the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria, using transmission pipelines. The market accounted for around 62 per cent of Australia's domestic gas consumption in 2012–13.<sup>94</sup>

The eastern market is moving from an isolated domestic market to one that is increasingly linked to international markets through new LNG export facilities. Eastern gas production (including from CSG) was 854 PJ in 2012–13.<sup>95</sup> This will need to triple to around 2,300 PJ by the end of the decade to meet forecast domestic and export demand.<sup>96</sup> The new LNG export industry in eastern Australia will bring enduring benefits to the economy (**Box 2**).

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<sup>94</sup> BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

<sup>95</sup> *Ibid*, BREE

<sup>96</sup> AER, 2013, *State of the Energy Market 2013*, Melbourne

**Box 2:** Benefits of LNG export industry**National:**

- Increased exports (growth from \$14.5 billion in 2012–13 to over \$60 billion in 2017–18)
- Over \$190 billion in capital investment committed to projects

**Queensland:**

- \$63 billion direct investment in projects
- 30,000 construction stage jobs
- 17,000 ongoing jobs from 2020, including direct and contractors
- Direct and indirect benefits for SMEs through supply chain business opportunities and flow-on economic activity
- Future service export opportunities for local firms

Source: Australian Government Department of Industry and BREE, 2014, *Eastern Australian Domestic Gas Market Study*, Canberra

The new LNG export industry from CSG is altering market dynamics, and creating issues for market participants. Consultation on the Eastern Australian Domestic Gas Market Study identified several issues for Australian Government attention.<sup>97</sup> The six themes of the study were gas market reform, supply competition, data and transparency, infrastructure, non-market interventions, and governance.

There are sufficient gas resources for both domestic and export purposes, although there are uncertainties relating to rising gas prices, lack of transparency, and concern about whether supply can increase quickly enough to meet rising demand.

The rate of change has caught many market participants unaware. Expected large volumes of ramp gas have not eventuated until recently, price offers for new gas supply contracts have risen sharply, and there is concern about the supply impacts of LNG projects not meeting their commissioning schedules.

The eastern Australian gas market is on the cusp of a massive increase in demand, largely through exports from the first LNG train that will start later this year. This will be followed by the progressive start-up of the remaining four LNG trains at the three projects over 2015–2019. AEMO, in an update of its November 2013 Gas Statement of Opportunities (GSOO) forecast, has revised downward the magnitude of potential gas supply shortfalls. Without timely investment in natural gas infrastructure and the development of reserves, there will be potential gas shortfalls in New South Wales across four winter days, and throughout the year in Queensland, in 2020.<sup>98</sup> Some incremental upgrades to infrastructure and contracts will develop extra gas supply, but more needs to be done. Santos and AGL are seeking to develop CSG projects in New South Wales and some industrial users have direct contracts with junior gas exploration companies.

Government policy and regulations should aim to minimise distortions to market signals while protecting the environment, water resources, farmland and communities. The Queensland Competition Authority recently reviewed the regulation of CSG and recommended removing duplicative legislative requirements to streamline regulation and reduce regulatory costs.<sup>99</sup>

South Australia is taking a proactive approach to developing unconventional gas, and has developed a roadmap for projects in the state that encourages the safe exploration and production of unconventional gas.<sup>100</sup>

<sup>97</sup> Australian Government Department of Industry, Gas market development, [www.industry.gov.au/gas](http://www.industry.gov.au/gas)

<sup>98</sup> AEMO, 2014, *Gas Statement of Opportunities: Update May 2014*, Melbourne

<sup>99</sup> Queensland Competition Authority, 2014, *Final Report: Coal Seam Gas Review, January 2014*, Brisbane

<sup>100</sup> Government of South Australia, 2012, *Roadmap for Unconventional Gas Projects in South Australia December 2012*, Adelaide

Policy uncertainty has led to CSG projects in New South Wales being delayed or suspended. In March 2014, the New South Wales Government announced a six-month freeze on processing new Petroleum Exploration Licence Applications, and is conducting an audit of existing Petroleum Exploration Licences as it puts in place a more comprehensive application process.

In August 2012, the Victorian Government announced a moratorium on the use of hydraulic fracturing or ‘fracking’, which is used in unconventional hydrocarbon (CSG, tight gas, and shale oil and gas) production. Fracking involves injecting a fluid (water, carbon dioxide (CO<sub>2</sub>), nitrogen, propane and oil based fluid) into a rock formation at high pressure to stimulate the flow of gas and oil from fractures in coal or other rock formations, such as shale or sandstone. The wider adoption of fracking in Australia has created some concerns around the types of fluids used, and the potential for contamination of ground water.

Community consultation is underway on the findings of the Victorian Gas Market Taskforce, released in November 2013, which recommended the removal of the moratorium and the issue of new CSG exploration licences, subject to reforms being carried out.<sup>101</sup> The moratorium will remain in place until at least July 2015, when the Victorian Government formally responds to the report.

COAG endorsed a National Harmonised Regulatory Framework for Natural Gas from Coal Seams in May 2013. The framework provides guidance to regulators and will ensure regulatory regimes are robust, consistent and transparent across Australia.

Gas market reform is needed to best use existing resources and infrastructure. The forecast of domestic gas demand, in particular, needs to be improved to help understand and manage the supply-demand balance.

## Northern market

The northern market is within the Northern Territory and connects users with gas fields in the southern onshore Amadeus basin and the offshore Bonaparte basin. The Northern Territory domestic market is Australia’s smallest, being less than two per cent of national consumption, mostly for mining and electricity generation. LNG production capacity will increase from almost four Mtpa to just over 12 Mtpa when the Ichthys LNG facility begins operation (expected in 2017).<sup>102</sup>

The northern gas market began exporting LNG from Darwin in 2006. However, its domestic market is insulated from LNG market dynamics because of long-term supply contracts for gas from the offshore Blacktip field, and the separation of the LNG projects from the domestic market.

There is growing interest in onshore unconventional gas exploration in the Amadeus, Georgina and other sedimentary basins, although infrastructure will be an important driver for development economics. The APA Group recently announced a feasibility study for a pipeline link to connect its northern and eastern gas markets pipeline assets. The two alternatives are a 1,000 km pipeline between Alice Springs and Moomba, and an 800 km pipeline between Tennant Creek and Mt Isa.<sup>103</sup>

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101 Victorian Government Department of State Development, Business and Innovation, 2013, *Victorian gas market taskforce: final report and recommendations*, October 2013, Melbourne

102 BREE, 2013, *Gas Market Report*, October 2013, Canberra

103 APA Group, 2014, *New pipeline developments, Linking Australia’s gas markets for improved energy security*, presentation, 20 August, Darwin



## Western market

The western gas market is within Western Australia. Transmission pipelines connect the main offshore production centres in the Carnarvon Basin to the southern population and industrial centres around Perth, and to Esperance through the Kalgoorlie/Boulder mining provinces.

The Western Australia Economic Regulation Authority regulates the western market (including gas pipelines), while the Independent Market Operator (IMO) operates Western Australia's Wholesale Electricity Market. In 2013, the IMO role was expanded to include collecting gas services information under the *Gas Services Information Act 2012* (Western Australia). The IMO has developed the Western Gas Bulletin Board and annually releases a Western Australia-specific GSOO.

Western Australia is Australia's largest gas-producing state, having contributed almost 63 per cent of the country's total natural gas production (including domestic gas and LNG) in 2012–13.<sup>104</sup> Just over half of Australia's gas reserves are in offshore basins along the north-west coast. Most of its production is exported, as LNG.<sup>105</sup>

In 2012–13, Western Australia's domestic consumption was about 516 PJ (approximately 37 per cent of Australia's domestic consumption), driven by electricity generation, manufacturing and mining.<sup>106</sup>

Domestic consumption is expected to grow slowly, with the Carnarvon basin expected to remain the major supplier to both the domestic and LNG markets. The Western Australia GSOO (2014) projects that gas production will increase over the next 10 years.<sup>107</sup>

The western gas market has evolved differently to the eastern market, with Western Australian gas resource development driven by LNG export opportunities. The Western Australia Government built pipeline infrastructure in return for domestic processing facilities being built by LNG companies.

In the western market, LNG exports began in 1989, shortly after domestic use began in 1984. Gas prices for new gas contracts began to increase after early long-term domestic supply contracts began expiring in 2004.

The Western Australia Government introduced a formal gas reservation policy in 2006, which required producers engaged in LNG exports to reserve 15 per cent of gas from each field for domestic use.

Gas prices under this policy are determined by the market, and Western Australia's domestic gas prices have increasingly become tied to LNG export prices. The Western Australian Economic Regulation Authority has recommended the Western Australian Government rescind its domestic gas reservation policy as soon as practicable, as it distorts the market and prevents Western Australia from realising the full value of its gas reserves.<sup>108</sup> The Western Australian Government is considering the authority's final report.

Production costs have been increasing and the continued development of gas resources is becoming more expensive. In addition, there are concerns about the lack of competition and market power making price rises worse. During the Varanus Island explosion supply crisis in 2008, short-term wholesale contracts were reported to be as high as \$14–\$16/Giga Joule (GJ).<sup>109</sup> Similar to the eastern market, there is low market transparency in the western and northern markets due to the predominance of two-way trading between a small group of producers and consumers.

In 2013, 97 per cent of Western Australia's gas production came from the Carnarvon basin, produced from four facilities: the Karratha Gas Plant (North West Shelf Joint Venture), Varanus Island (East Spar and Harriet joint ventures), Devil Creek (Apache) and Macedon production facilities (BHP Billiton). The remaining production capacity came from the onshore Perth basin.<sup>110</sup>

<sup>104</sup> BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

<sup>105</sup> BREE, 2013, *Gas Market Report, October 2013*, Canberra

<sup>106</sup> BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

<sup>107</sup> WA Independent Market Operator, 2014, *Gas Statement of Opportunities- January 2014*, Perth

<sup>108</sup> Economic Regulation Authority, *Inquiry into Microeconomic Reform in Western Australia: Final Report, June 2014*, Perth

<sup>109</sup> Economics and Industry Standing Committee 2011, *Inquiry into domestic gas prices*, Legislative Assembly, Parliament of Western Australia, Perth

<sup>110</sup> Western Australia Independent Market Operator, 2014, *Gas Statement of Opportunities- January 2014*, Perth

The ACCC has authorised two joint marketing arrangements in Western Australia to encourage domestic supply by reducing the commercial risks of trading in a developing market. Competition should increase over the coming years with the Gorgon and Wheatstone joint ventures’ domestic production facilities expected to come on-line from 2016–2018. The Competition Policy Review should identify if there are any significant issues with the continuation of this arrangement. There is potential to introduce a trading hub in Western Australia, similar to that now running in Wallumbilla, Queensland.

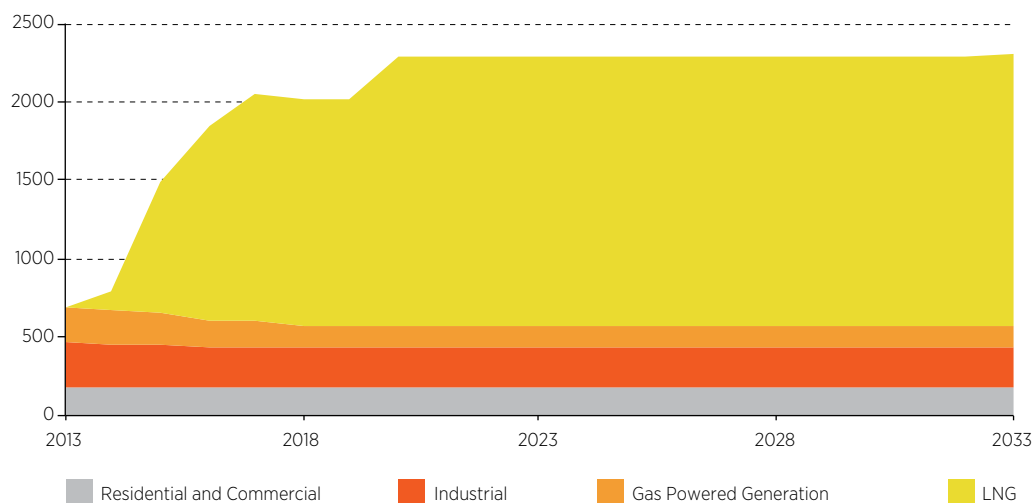
The progressive re-negotiation of the North West Shelf Joint Venture’s domestic contracts is an important determinant of future gas market expectations. The Western Australia GSOO (2014) forecasts there may be insufficient gas (at forecast prices) to meet forecast domestic demand if the North West Shelf Joint Venture does not provide gas to the domestic market beyond existing contracts that will expire in 2020. This will depend on whether it is economic to develop the less accessible gas fields and upgrade the processing facilities.<sup>111</sup>

## Major issues

### Addressing near-term east coast gas supply

There is upward pressure on east coast gas prices as the domestic market enters the higher priced international market through Queensland LNG exports starting in 2014. LNG projects face the challenge of increasing CSG production to deliver on export contract commitments (**Figure 8**). No other nation has tried to develop an LNG export project, let alone three, based on CSG resources. Timely development is critical to ensuring LNG export contracts are satisfied, while meeting domestic demand.

**Figure 8:** Projected eastern Australia annual gas demand by segment, reference scenario



Source: Core Energy Group (2013)

The large scale of LNG export development means that even small deviations from schedules are likely to have serious short-term implications for the eastern gas market. Any delays in upstream development will cause LNG project proponents to compete for extra gas supplies from the domestic gas market to meet any shortfall. This uncertainty is already putting upward pressure on gas prices. In the short-term, additional gas supplies are being sourced from the Cooper Basin along with extra CSG from Queensland. Uncertainty about short-term supply could be causing suppliers to be cautious about committing supply to the domestic market before exports have started.

<sup>111</sup> *Ibid*, Western Australia Independent Market Operator

The Australian Government does not consider the eastern Australian gas market to be fundamentally broken, even though there is no short-term 'fix' for potential near-term supply shortages and price pressures facing major users. These users include manufacturers of chemicals, plastics, glass, alumina, fertiliser and cement.

Forms of gas reservation, national interest tests or export controls have been adopted domestically in Western Australia and Queensland (where they are in place but yet to be applied), as well as internationally in the United States and Canada. However, the Australian Government notes these policies can distort market signals, increase the risk of underinvestment, and defer the development of new gas supply. Such policies may have no short-term impact unless applied to existing projects, causing potentially unacceptable sovereign risk.

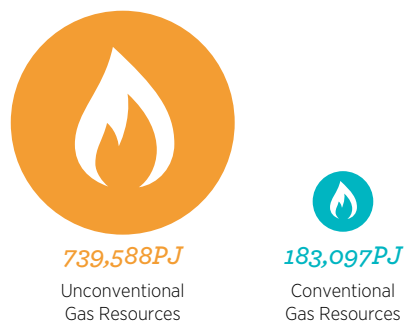
The Australian Government considers that bringing on new east coast supply as quickly as possible, and improving market transparency and competition, are the best responses to eastern gas market pressures. The Australian Government does not propose to pursue any form of intervention, such as reservation policies.

New technology and rising gas prices are improving the viability of previously un-economic gas resources, with consultation on the Eastern Australian Domestic Gas Market Study pointing to increasing gas supply as the best response to price pressures. Producers cite regulatory barriers as the main impediment to new supply.

## Sustaining national gas supply

CSG and other unconventional gas resources, such as shale gas and tight gas, can potentially increase supply and grow regional economies. Australia has large unconventional gas resources, estimated at almost 740,000 PJ compared with conventional gas resources of around 183,000 PJ (Figure 9).<sup>112</sup>

**Figure 9:** Australia's gas resources



Some in the community, particularly landholders and local residents, are apprehensive about or opposed to CSG and other unconventional gas developments. Concerns include potential environmental, health and social impacts, and potential landholder disruption during exploration and development. State government restrictions on CSG development reflect this community concern.

It is important that the gas industry engage genuinely, as early as possible, with communities that have, or are likely to have, an interest in projects. Engagement allows industry to understand community views and concerns, and allows communities to understand any project, as well as the proponent's plans to mitigate impacts and manage risks. Recent New South Wales Government studies on CSG are examples of the information needed to reassure affected communities.<sup>113</sup>

<sup>112</sup> Geoscience Australia and BREE, *Australian Gas Resource Assessment 2012*, Canberra.

<sup>113</sup> Office of the NSW Chief Scientist and Scientific Engineer, *Environmental risk & responsibility and insurance arrangements for the NSW CSG industry*, June 2014, Sydney.

Office of the NSW Chief Scientist and Scientific Engineer, *Measuring the cumulative impacts of all activities which impact ground and surface water in the Sydney Water Catchment*, June 2014, Sydney.

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development provides advice to the Australian Government and state and territory government regulators on the water-related impacts of CSG and large coal mining developments. This publicly available advice must be taken into account by regulators in making approval decisions on these developments. Lessons from the development of CSG can guide a new strategic approach to the assessment, management, and the regulation of other unconventional gas resources. This approach includes:

- better mapping of water resources
- reconciled petroleum titles and a range of land uses
- improved management and monitoring of processes used in production, including of water use and production, hydraulic fracturing and chemical use
- streamlined and harmonised legislation
- more information to support community engagement.

*The Australian Government will work with states and territories on improvements to licence management policies and removal of unnecessary barriers to supply.*

*The Australian Government will work with states and territories to facilitate the approval of priority gas projects. Goals are to improve cooperation on, and access to, pre-competitive geo-scientific information, and to improve the coordination, transparency and accountability of both offshore and onshore gas exploration licence approval processes.*

*The Australian Government will prepare a strategy to support the responsible development of the CSG industry and other unconventional gas resources, in consultation with state and territory governments.*

## Gas prices are not transparent

Gas prices have recently risen sharply. Although this was expected, large industrial users have expressed particular concerns over the rapid increases, coupled with the lack of available supply alternatives. Emerging oil-linked pricing for domestic gas supply contracts is a further complexity for large industrial gas users to manage. Under oil-linked pricing, wholesale gas prices are indexed to, and move with, an international oil benchmark.

Higher prices are of concern to large industrial gas users, following a difficult period for manufacturers, in particular, with a high Australian dollar, high wage costs, rising input costs, import competition, and constraints on passing through costs. Concerns are heightening as rising prices and potential near-term supply shortages coincide with the expiry of many domestic gas supply contracts in 2017.

The rising gas prices in the eastern gas market present uncertainty for both gas sellers and buyers. In any market, a rising price is not in itself a policy problem. However, as sellers have more market information available than buyers, an information asymmetry is created, favouring sellers over buyers. Rising gas prices and supply uncertainties may cause sellers to delay executing supply contracts. Price outcomes could be influenced by market power, making the adjustment to new prices more severe than necessary. There is no suggestion that any market participants are acting improperly.

Market participants have access to limited and often fragmented information regarding upstream drilling rates and well performance. The lack of upstream performance information creates uncertainty among market participants regarding the likely future availability of gas, which makes price discovery difficult, and might influence negotiated price outcomes.

The Eastern Australian Domestic Gas Market Study looked at whether there were issues that could limit market competition and delay an efficient market response to potential near-term supply shortages. The study found these competition issues were difficult to assess using available public data. A review of competition by the ACCC or the Productivity Commission could be used to determine the effectiveness of competition in gas markets.

Not surprisingly, stakeholders were divided on the impacts on competition. Producers pointed to recent contracts as evidence of a competitive market, while users and infrastructure providers cited high prices and difficulties in getting supply offers as examples of the potential misuse of market power.

There may be market structures that prevent effective competition among existing participants, including the pricing and contracting practices of producers, statutory exemptions for joint marketing arrangements, and the LNG interests of some gas producers. Most gas supplied to the domestic east coast market is sold by producers from the Cooper and Gippsland basins under joint marketing arrangements that are exempted from the provisions of the *Competition and Consumer Act 2010*. The lack of information and transparency to the wider market also limits the further development of markets for gas and commercial risk management products.

The Australian Government has concerns about inefficiencies in the gas market. Two-way contracts are typically confidential, complex, and contain an array of terms and conditions. They have served market participants well in the past when prices were historically low. In the current rapidly changing market, however, two-way contracting alone limits the ability of businesses to negotiate confidently on prices and can mean higher transaction costs.

The rapidly changing dynamic of the gas market may require new strategies to secure gas supply. Some large users in Australia are adopting methods, including:

- negotiating directly with or investing in upstream explorers and producers
- embracing shorter-term contracts or less restrictive terms and conditions
- establishing in-house gas market expertise
- developing relationships with specialised gas procurement consultants.

*An ACCC Price Inquiry into the eastern Australian wholesale gas market, under Part VIIA of the Competition and Consumer Act 2010, or a Productivity Commission review, could examine the levels of competition in the eastern gas market. Such an inquiry could inform consumers about future market conditions and opportunities to increase competition in the upstream market, including opportunities to remove unnecessary regulation, and issues that may limit wholesale market competition.*

*The Australian Government will publish increased information through the Bureau of Resources and Energy Economics (BREE) to improve market information and efficiency of outcomes. Regular reports will provide updates on Australia's gas markets, including aggregated information on upstream activity, and CSG well drilling schedules and production rates where possible.*

*The Australian Government will work with AEMO to enhance the National Gas Market Bulletin Board and improve projections on reserves, production, storage and adequacy of supply in the GSOO. These measures will be in place by early 2015 and reviewed two years later.*

## Improving gas market function

Gas producers, major users, and retailers in eastern Australia are required to trade imbalances (excess or insufficient) of contracted gas supplies in wholesale markets. These trade bids and offers set the daily market prices.

Three wholesale gas-facilitated markets operate in the eastern gas market: the Short Term Trading Market (STTM), the Victorian Declared Wholesale Gas Market (DWGM) and the Gas Supply Hub (GSH). Set up in 1999 by the Victorian Government, the DWGM manages and balances gas flows across the Victorian Transmission System. The Sydney and Adelaide STTMs opened in 2010, and the Brisbane STTM in 2011.

In March 2014, Australia's first voluntary upstream gas market, the GSH started. The GSH uses a brokerage model that matches and clears trades between two parties using existing transmission infrastructure located at Wallumbilla, Queensland. It aims to improve transparency and flexibility in upstream gas transactions, efficiently allocate and price short-term gas and support increased trade between regions. If the hub model proves successful, there is the potential to develop hubs in other locations.

As the dynamics of the gas markets change, there is likely to be increasing use of storage. Extra storage close to demand centres could improve the ability of suppliers to respond to peak use, and help gas producers keep a constant production profile, rather than altering production to match daily demand variations.

Access to new and existing pipeline, storage and processing infrastructure is important for the economic production of new gas resources. There is currently limited publicly available information on capacity utilisation, capacity trading activity, and the price and demand for secondary pipeline capacity. The Gas Transmission Pipeline Capacity Regulation Impact Statement (RIS) measures, endorsed by COAG in December 2013, will require pipeline operators and shippers to provide AEMO with enhanced capacity utilisation and trading data, which will be published on AEMO's online National Gas Market Bulletin Board.<sup>114</sup> The measures also require AEMO to redevelop the Bulletin Board to improve the presentation of existing and new pipeline capacity data and introduce an eastern market capacity listing service.

*The Australian Government will establish, in consultation with stakeholders and state and territory governments, a longer-term gas market agenda to promote an efficiently operating market. Mechanisms for improved flexibility and responsiveness could include hubs and pipeline capacity trading.*

*The Australian Government will work through the COAG Energy Council to strengthen the gas market reform governance framework through updating and progressing the implementation of the Gas Market Development Plan agreed reforms. This will provide market participants with confidence in a sound policy framework, encompassing both upstream and downstream industry.*

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114 COAG Energy Council, Gas Transmission Pipeline Capacity Trading, [www.scer.gov.au/workstreams/energy-market-reform/gas-market-development/](http://www.scer.gov.au/workstreams/energy-market-reform/gas-market-development/)

## Feedback sought

The Government seeks comments on ways the Goals set out at the beginning of this chapter could be achieved.

Below is a brief summary of the actions outlined in this chapter that the Australian Government is either currently pursuing, or which are proposed, to achieve the Goals in this chapter.

- **Addressing near-term east coast gas supply**

*More gas supply needs to be supplied quickly to avoid potential near-term east coast shortages. Social licence and landholder concerns have led state governments to introduce regulatory barriers.*

- **Sustaining national gas supply**

*Environmental and social concerns about new onshore gas projects have led to restrictive regulation and community disruption of projects. The Australian Government can apply the capabilities of national science institutions to improve the independent evidence base for assessing the impact of proposed projects. It will also work with states and territories to remove unnecessary barriers to new projects.*

- **Gas prices are not transparent**

*There is limited reporting of gas production potential, and limited trading information on the extent of competition in gas markets. There are also some exemptions from competition laws to allow joint marketing. Many of the underlying sources of competition are therefore difficult to assess. The Australian Government is considering either an ACCC Price Inquiry or Productivity Commission Review into these competition issues to help identify any barriers to competition as the market responds to current high gas price signals.*

- **Improving gas market function**

*The nature of gas market bilateral trading means there is limited supply and price information available for consumers to understand market conditions. The Australian Government will implement further reporting through BREE and AEMO to provide greater transparency.*

*Domestic gas market function would be enhanced by a comprehensive development strategy for the unconventional gas industry. Improved trading mechanisms could include further trading hubs and pipeline capacity trading.*

## 4 Security, innovation and energy productivity

### Goals

- **Maintain secure, competitively-priced and reliable energy supplies**
  - Outcome: Consumers have access to adequate and reliable energy.
- **Improve energy productivity**
  - Outcome: Cost savings to Australian households and businesses, improved domestic security and reduced greenhouse gas emissions intensity.
- **Develop a better ‘outlook’ capacity**
  - Outcome: Government better prepared to respond to supply issues, to global market opportunities, and to invest strategically in research. Industry will have access to better information, giving more certainty and encouraging investment.
- **Keep the range of energy options technology neutral by tackling regulatory barriers and making best use of research investments**
  - Outcome: Australia is able to choose from the broadest possible range of energy options. This will strengthen Australia’s energy security.
- **Look for relevant international technology engagement**
  - Outcome: Australian industries benefit from international experience.

### Introduction

The Australian Government is committed to the broadest possible range of energy sources and technologies to give flexibility in future energy choices. The challenge is to encourage investment in technologies that are likely to be part of Australia’s future energy supply, without causing unnecessary energy cost increases.

Australia’s domestic energy sources are changing slowly, but coal still provides 33 per cent of total energy consumption and generates 64 per cent of electricity. Petroleum-based fuels, mainly for transport, account for a further 38 per cent of total consumption, and gas 24 per cent. Renewable energy provides the remaining six per cent.<sup>115</sup>

Adequate, reliable and competitively priced energy, delivered through transparent energy markets, will continue to be the cornerstone of Australia’s energy security, allowing Australia to respond to supply disruptions and meet the long-term requirements of domestic energy users.

The 2011 National Energy Security Assessment (NESA) identified several watch-points in relation to Australia’s future energy supplies, including:

- Australia’s declining oil refining capacity
- uncertainties surrounding CSG developments
- LNG developments on the east coast causing supply shortages
- energy price pressures
- investment uncertainty, due to the carbon tax and related policies.<sup>116</sup>

The NESA also highlighted the increasing importance of energy supply diversity, the interconnection of networks, and efficient markets. Specific findings on gas and liquid fuels remain relevant, but the electricity sector has changed significantly since 2011. The NESA will be updated in 2015.

<sup>115</sup> BREE 2014, *2014 Australian Energy Statistics Update*, Canberra

<sup>116</sup> Australian Government, 2011, *National Energy Security Assessment*, Canberra

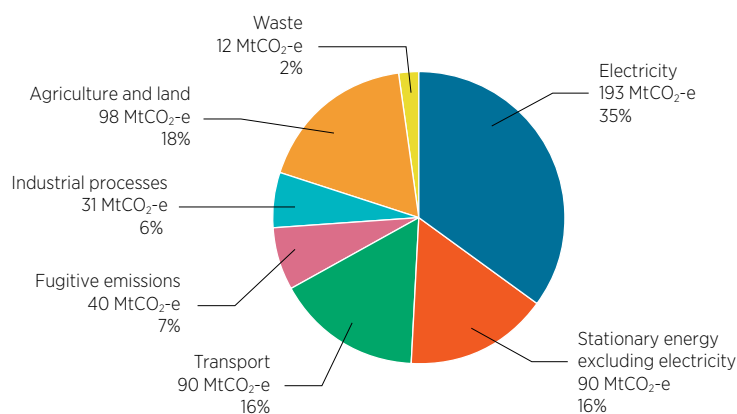


Future energy supply issues are also considered in the Australian Government's periodic Australian Energy Technology Assessment<sup>117</sup> (AETA), Australian Energy Resources Assessment<sup>118</sup> (AERA), and infrastructure reviews. In 2014, the Australian Government will release the first Australian Liquid Fuels Technology Assessment (ALFTA), which will analyse the life-cycle costs of a range of liquid fuel technologies.

Australia has an emissions-intensive economy because of the reliance on fossil fuels and the structure of the economy. Australia's 2012 emissions were 554 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e). These emissions were from across the economy.<sup>119</sup> Electricity generation accounted for over one-third of total emissions (**Figure 10**). The Government is committed to reducing Australia's emissions to meet its target of five per cent below 2000 levels by 2020.

Australia is engaged, with other countries under the United Nations Framework Convention on Climate Change (UNFCCC), in negotiations for a new global agreement that will include emission reduction commitments for the period beyond 2020. Countries will consider their commitments to post 2020 climate action in the lead up to the final negotiations on a new agreement in 2015. These post-2020 commitments could have implications for the composition of the global energy mix.

**Figure 10:** Australia's National Emissions Inventory 2012



Source: Department of Environment, *Australia's National Emissions Inventory Report 2012*, Canberra

Australia's emissions intensity is expected to fall by 2030 as economic growth outpaces the growth in emissions. However, projected growth in emissions is mainly in the production and distribution of fossil fuels, particularly LNG and coal exports, and combusting these fuels (generating heat, steam or pressure) in processes such as manufacturing and heating. Electricity emissions are projected to be stable because of slow growth in use, and the increased share of large and small-scale renewable supply. This will be examined in the 2014 emission projections in light of the recent National Electricity Forecasting Report 2014, which forecast a decline in electricity demand. Transport emissions are expected to increase about one per cent a year, with strong growth in all forms of transport. This growth is expected to be partly offset by fuel and efficiency improvements, and by a modest uptake of alternative fuels and technologies beyond 2020.<sup>120</sup>

The Australian Government has established the ERF as the centrepiece of the Direct Action Plan. The ERF is designed to reduce emissions at lowest cost over the period to 2020, and contribute towards Australia's emissions reduction target. The ERF will provide incentives for emissions reductions based on opportunities, including upgrading commercial buildings, improving the energy efficiency of industrial facilities and domestic premises, reducing electricity generator emissions, capturing landfill gas, reducing waste coal mine gas, and upgrading vehicles and improving transport logistics. Further information is available in the ERF White Paper, published in April 2014.<sup>121</sup>

<sup>117</sup> BREE, 2013, *Australian Energy Technology Assessment 2013 Model Update*, Canberra

<sup>118</sup> Geoscience Australia and BREE, 2014, *Australian Energy Resources Assessment Second Edition*, Canberra

<sup>119</sup> Department of Environment, *Australia's National Inventory Report 2012*, Canberra

<sup>120</sup> Australian Government Department of Environment 2013, *Australia's Abatement Task and 2013 Emissions Projections*, Canberra

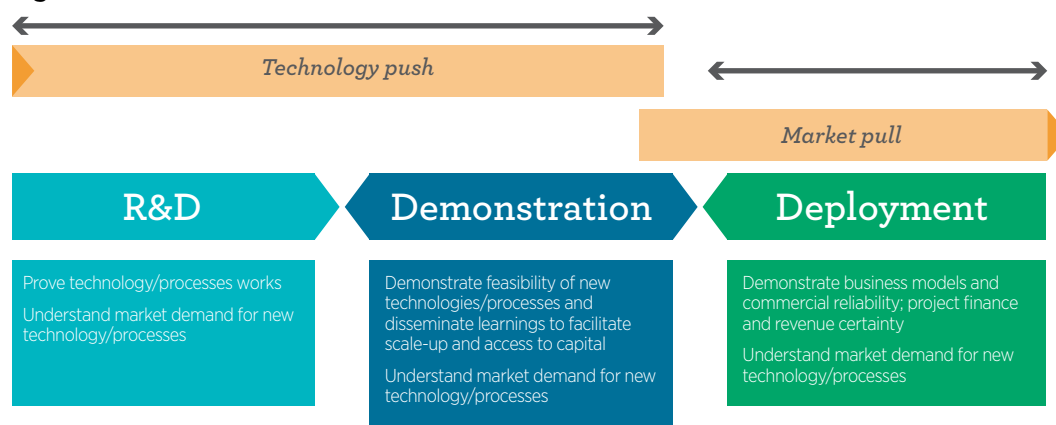
<sup>121</sup> Australian Government Department of Environment 2014, *Emissions Reduction Fund White Paper*, Canberra

Improvements in energy productivity are achieved by increasing outputs for every unit of energy used. This could involve using less energy to produce the same output (energy efficiency) or producing more output with the same energy (improved production efficiencies).

Alternative and emerging energy sources and technologies diversify Australia’s domestic energy supply (particularly in transport fuels), as well as reducing emissions.

New technologies face barriers as they move along the innovation chain. Demonstration projects can be costly and can have difficulty getting investment without proven technical performance. There can be ongoing difficulties with access to finance for commercialisation, or regulatory barriers. Government and private investment can help technologies through to commercialisation (**Figure 11**).

**Figure 11:** Innovation chain



National energy research collaboration, international technology exchange, and flexible regulations improve the uptake of new energy technologies. New technologies can enter the market through either local innovation and commercialisation or adaptation of overseas technologies. Australia should continue to work with international partners on developing the next generation of energy technologies that lower costs to consumers, reduce emissions and other environmental impacts, or help unlock Australian resources.

## Major issues

### Reliable energy supply

Australia’s existing emergency response arrangements and regulations cover electricity, gas and liquid fuel supply disruptions, with most disruptions contained within local networks. National arrangements apply to gas and liquid fuels, but the national electricity market emergency arrangements only apply to the east coast. Broader national emergency management arrangements may apply to unforeseen incidents and extreme events, such as a natural disaster. These are outlined in the Australian Emergency Management Arrangements and Australian Government Disaster Response Plan.<sup>122</sup>

The reliability and safety of energy distribution infrastructure relies on its parts performing to standards and technical specifications. Standards, measurement and accreditation all support energy security in numerous ways. Electricity reliability comes from standards built into generators, transmission networks, and distribution networks. While the reliability can vary in different parts of the network, the average reliability is high. For example, electricity transmission lines must withstand lightning strikes, and the equipment standards require parts, such as insulators, to be properly tested. The uptake of new technologies, and consumer confidence in product integrity, rely on up-to-date measurement standards. Without this robust framework, market failure could compromise energy security.

<sup>122</sup> Australian Government Attorney General’s Department, Australian Government Emergency Management Plans, [www.em.gov.au/Emergencymanagement/Preparingforemergencies/Plansandarrangements/Pages/AustralianGovernmentEmergencyManagementPlans](http://www.em.gov.au/Emergencymanagement/Preparingforemergencies/Plansandarrangements/Pages/AustralianGovernmentEmergencyManagementPlans)

Examples include:

- measuring the input and output of energy generation, transmission and consumption
- measuring the volume, pressure and energy content of domestic and exported gas
- measurement accuracy of electricity meters, including smart meters
- documentary standards for the National Greenhouse and Energy Reporting System, which in turn refer to methods for measuring emissions
- liquid fuel standards for vehicle operability and environmental protection.

Australia's standards and conformance infrastructure includes:

- Standards Australia, responsible for documentary standards
- National Measurement Institute, responsible for peak technical measurement and regulation of measurement used for legal and trade purposes
- National Association of Testing Authorities, responsible for accreditation against applicable quality standards that include correct measurement.

## Electricity supply

Most of Australia's current surplus generation capacity is in the NEM and the SWIS. Much of it comes from ageing coal generators approaching, or past, their original design life.<sup>123</sup> The age of coal generators is not a problem in the short-term, however, since the oldest units are refurbished.

The low wholesale price for electricity is not expected to change quickly, and some utilities are finding it difficult to get finance for major refurbishment, which could eventually affect plant reliability. A number of units have been mothballed, but not permanently removed. In the event that electricity demand picks up, extra generation could come from restarting mothballed generation. This is more likely to be coal-fired as gas may not be able to step in quickly and cost-effectively, due to pressures on gas supply and price.

New generation capacity is not needed before 2023–24.<sup>124</sup> Supply constraints could arise because of an event that affects critical infrastructure, for example, coal-fired generators still use large amounts of water during a drought.<sup>125</sup> Western Australia and the Northern Territory mainly use natural gas for electricity generation and if a severe gas supply disruption occurred, many gas-fired generators could co-fire with diesel instead.

Adequate infrastructure to meet local electricity demand underpins the energy supply system. Network businesses, which are a regulated monopoly, receive a regulated rate of return on their assets, set by the AER. State and territory governments (except Victoria and South Australia) own the network businesses. All states and territories have introduced state-specific reliability arrangements.

The Productivity Commission found that problems in transmission can go unseen until peak demand and coincident failures in generation or network equipment overstretch the system. However, transmission problems are rare.<sup>126</sup> Most outages are due to distribution network issues, and it is not cost-efficient to seek to remove all potential causes of network outages.<sup>127</sup> Re-routing of supply when there is an issue in one part of the network can often prevent a disruption to supply, and this provides an alternative to further network investment.

<sup>123</sup> Simshauser, P and Nelson, T. 2012, 'The second-round effects of carbon taxes on power project finance,' *Journal of Financial Economic Policy*, Vol. 4, No. 2, pp. 104–127

<sup>124</sup> AEMO, 2014, *Electricity Statement of Opportunities*, Melbourne

<sup>125</sup> AEMO publishes the Energy Adequacy Assessment Project to provide an analysis of the potential effects of water availability and other energy constraints on the electricity system, based on three rainfall scenarios, over a 24 month period, AEMO, 2014, *Energy Adequacy Assessment projections*, June 2014, Melbourne

<sup>126</sup> Productivity Commission 2013, *Electricity Network Regulatory Frameworks*, Canberra

<sup>127</sup> AEMC, 2013, *Factsheet: what is reliability?*, Sydney

## Gas supply

An interconnected gas transmission pipeline links the major gas basins in southern and eastern Australia, providing choice of supply and improving competition. Some of the major pipelines are subject to economic regulation, and work is underway to improve transparency of pipeline operation, including the trading of unused pipeline capacity.

AEMO, in an update of its November 2013 GSOO forecast, has revised downward the magnitude of potential gas supply shortfalls. Without timely investment in natural gas infrastructure and the development of reserves, there will be potential gas shortfalls in New South Wales across four winter days, and throughout the year in Queensland, in 2020.<sup>128</sup>

The Western Australia IMO notes the broader gas market could experience supply pressure from 2021 to 2023. The balance of gas supply and demand depends on continued supply from the North West Shelf (through Western Australia's domestic gas reservation policy). There appears to be enough gas resources to meet very long-term future demand. However, over 65 per cent of this is unconventional gas that is yet to be properly verified or commercialised. Using only conventional resources, Western Australia IMO's GSOO estimates that resources can meet demand until some time between 2050 and 2065.<sup>129</sup>

The Northern Territory Government has secured supply until 2034. There is potential for the Northern Territory to supply into the eastern gas market but it would need a new pipeline to connect the two markets. Responses to these gas issues are considered in **Chapter 3**.

## Transport fuels

Domestic transport uses 73 per cent of all liquid fuels, with road transport accounting for 74 per cent of this. Australia's production of refined liquid fuels supplied around 68 per cent of demand in 2011–12.<sup>130</sup>

Australia has six major oil refineries. One of the largest, Kurnell in Sydney, is scheduled to close in the second half of 2014. Bulwer Island in Brisbane is to close in 2015. These closures reflect the comparative disadvantages of Australian refineries, including age, small size, and labour and construction costs.<sup>131</sup> The NESAs will monitor this declining capacity, assess the potential impacts and provide early warning if it is likely to become a problem.

Supply is maintained using domestic refineries, crude oil and refined product import terminals, and other stockholding facilities. Most of the supply chain is mobile, with about one-third of domestic supply at sea (at any one time) using a number of diversified and flexible shipping routes. Some 53 per cent of product supply comes from Singapore.<sup>132</sup> Mitsubishi has announced that it will build a diesel import terminal at Port Bonython in South Australia, thereby increasing Australia's fuel supply options.<sup>133</sup>

Alternative transport fuels are niche products in Australia, supplying around five per cent of demand. LPG is a by-product of natural gas and crude oil refining, which has around a three per cent market share of transport energy use, mainly in light vehicles. LPG vehicle conversions and sales of new LPG vehicles grew quickly over the past decade with the assistance of vehicle rebates and low LPG prices. This growth has slowed and conversions have reduced by 90 per cent over the past five years, from a peak of 85,000 in 2008–09.<sup>134</sup> New vehicle sales have followed a similar trend. Increased prices and phasing out of rebates are behind this decline. Special fuel excise arrangements apply to LPG used for transport, where the LPG excise rate is currently 10 cents per litre (12.5 from 1 July 2015) compared to around 38.1 cents per litre for petrol and diesel.<sup>135</sup> The Australian Government is proposing that fuel excise should rise with inflation.<sup>136</sup>

128 AEMO, 2014, *Gas Statement of Opportunities: Update May 2014*, Melbourne

129 Independent Market Operator of Western Australia 2014, *Gas Statement of Opportunities*, Perth

130 BREE, 2013, *Energy in Australia*, Canberra

131 BREE, 2013, *Energy in Australia*, Canberra

132 Hale and Twomey 2013, *Australia's Maritime Petroleum Supply Chain*, prepared for the Department of Resources, Energy and Tourism, Canberra, Wellington

133 Mitsubishi Corporation, *Mitsubishi Corporation Launches Diesel Business in Australia*, media release, 22 July, Tokyo

134 LPG Vehicle Scheme statistics

135 *Excise Tariff Amendment (Taxation of Alternative Fuels) Act 2011*

136 Australian Government Budget 2014–15, *Budget measures, Budget Paper No. 2 2014–15*, 13 May 2014, The Treasury

Compressed Natural Gas (CNG) is mainly used in road transport, largely trucks and urban buses as an alternative to diesel, with quieter engines and lower emissions. There are several CNG heavy vehicles available in Australia. CNG has around a quarter of the energy density of a conventional fuel, such as diesel, which leads to issues around the size of the fuel tank required and vehicle range. There is limited refuelling infrastructure in Australia. AGL has announced plans for CNG refuelling stations across the east coast of Australia.<sup>137</sup>

In Australia, LNG is a potential diesel alternative for heavy vehicles. Barriers to uptake include refuelling infrastructure, and vehicle availability. To address infrastructure issues, there are proposals to develop an LNG highway servicing Australia's eastern seaboard. An estimated 200 LNG heavy vehicles operate in Australia, most of them imported or converted after purchase.<sup>138</sup>

Feedstock makes up 70–85 per cent of the total production costs of ethanol, which is a renewable liquid transport fuel. In Australia, ethanol is mainly from wheat (waste starch), fermented sugarcane (molasses), and grain sorghum. A 10 per cent blend of ethanol (E10) is used as a substitute for petrol, while an 85 per cent ethanol-based petrol blend (E85) currently has limited availability in Australia and is only suitable for use in 'flex fuel' vehicles.<sup>139</sup>

Biodiesel is made using animal fats (tallow) and vegetable oils, such as canola and soybeans, which contain fatty acids. It is used as fuel in blends with mineral diesel containing up to five per cent biodiesel (B5) in standard diesel engines. Some vehicles (mainly heavy vehicles) can use blends containing up to 20 per cent biodiesel (B20). Australia imports around half its biodiesel.<sup>140</sup>

Current Australian Government support for biofuels includes reimbursement of excise, the Cleaner Fuels Grants Scheme and the Ethanol Production Grants Program.<sup>141</sup> However, from 1 July 2015, these programmes will close and ethanol and biodiesel will be excise-free until 1 July 2016, when an excise will be phased in over a five-year period based on a discounted energy-content rate. The excise equivalent customs duty for imported ethanol and biodiesel will be retained.

Electric vehicles (including hybrid electric, plug-in hybrid and all electric) have an advantage over alternative fuels, with the fuel supply drawn from well-developed electricity sources. There are, however, several disadvantages compared with the current fleet, including high vehicle prices, unsophisticated sale and maintenance networks, limited recharging infrastructure, and motorists' concerns. The consumer concerns holding back growth include range anxiety (and limited recharging choices), vehicle performance and higher up-front costs.

Electric vehicles are improving their traction in major overseas markets such as Canada, China, the European Union, India, Japan and the United States. Take-up in Australia has been slow, with only 64,000 vehicles (mainly hybrids) sold between 2005 and 2013. This is less than one per cent of new light vehicle sales over this period.<sup>142</sup> Economies of scale could make an alternatively-fuelled bus fleet more cost-effective. There is also strong uptake of hybrid vehicles for urban taxi fleets.

In the longer-term, declining domestic refining capacity and increasing dependency on fuel imports, particularly for specific fuel types, could enhance concerns about the level of risk to Australia's national security. Issues relating to the Department of Defence's liquid fuel preparedness will be considered as part of the Defence White Paper process.

137 AGL, 2014, *AGL unveils alternative fuel vision at international truck show*, media release, 3 April, Melbourne

138 Clean Energy Fuels Australia, *Liquefied Natural Gas Applications*, [www.cleanenergyfuels.com.au/lng/lng\\_applications](http://www.cleanenergyfuels.com.au/lng/lng_applications)

139 IPART, 2012, *Review of Ethanol Supply and Demand in NSW, June 2012*, Sydney

140 Biofuels Association of Australia, *Biodiesel in Australia*, [www.biofuelsassociation.com.au/biodiesel-in-australia](http://www.biofuelsassociation.com.au/biodiesel-in-australia)

141 Australian Taxation Office, *Cleaner fuels grants scheme guide*, <https://www.ato.gov.au/Business/Fuel-schemes/In-detail/Cleaner-fuels-grants-scheme/Cleaner-fuels-grants-scheme-guide/> and Australian Government Department of Industry, *Ethanol Production Grants program*, [www.industry.gov.au/Energy/Programs/Pages/EthanolProductionGrantsprogram.aspx](http://www.industry.gov.au/Energy/Programs/Pages/EthanolProductionGrantsprogram.aspx)

142 Federal Chamber of Automotive Industries, *VFACTS annualised data 2005–2013*, Canberra

There are several ways to increase domestic liquid fuel holdings. The benefits of doing so will need to be balanced against costs to consumers. As a member of the IEA, Australia is required to hold stocks (equivalent to 90 days of prior year's net imports), which can be released as part of an IEA-agreed collective action in the event of supply disruptions. Increasing demand for oil (and oil refined products) along with declining indigenous production has created a shortfall against Australia's IEA commitment. Australia relies solely on the commercial stockholding of industry, which currently stands at less than 60 days of net imports, to meet this treaty obligation.<sup>143</sup> The Australian Government is considering the views provided by stakeholders, including the IEA, on the benefit of government-controlled or mandated stocks in excess of the commercial levels held by industry, in the context of a modern oil market in the Asia-Pacific that is much changed since Australia joined the IEA. The Government will also continue to improve the quality and coverage of related petroleum data to support liquid fuel security policy development and international reporting obligations.

Increased domestic production of cost-competitive alternative transport fuels could strengthen Australia's liquid fuel security by diversifying supply. The Government considers such strengthening will only come from alternative transport fuels that successfully integrate into the broader transport fuel market by being secure and reliable in supply, meet requisite fuel standards, and deliver on consumer needs.

## Improving energy productivity

At a national scale, energy productivity is the output an economy achieves from the energy it uses. It is a measure of the economic value derived from energy use. Enhancing Australia's energy productivity is a cost-effective measure to decouple economic growth from growth in greenhouse gas emissions. Improved productivity can also improve business competitiveness and reduce costs for households and businesses. Energy productivity improvements can come from more energy efficient buildings, improved processes or equipment in manufacturing, improved transport, and better knowledge and management of energy.

The Australian experience has been that, within large corporations over the past five years, \$1 invested in improving energy productivity has delivered almost \$4 in savings.<sup>144</sup> In addition to cost savings, energy productivity can deliver flow-on benefits including lower maintenance and training costs, and improved quality control.

In industrial processes, energy productivity is about maximising output while minimising energy as an input cost. This is typically achieved through process optimisation, production efficiencies, and capital improvements. Currently available energy efficiency technologies include variable speed drives, embedded load control, and waste energy capture and reuse (such as co/trigeneration). More efficient motors and compressors also have potential to significantly reduce energy consumption. The IEA estimates industrial energy savings potential as around 20 per cent in the five most energy intensive industries if they applied the best available technologies.<sup>145</sup>

Smaller businesses can also benefit from better energy productivity, including through better energy information and management. A small business occupying 1,000 square metres of office space can easily save more than \$14,000 per year in energy costs by leasing space with efficient lighting.<sup>146</sup> Fruit-growing businesses can save more than \$16,000 per year from cost-effective energy upgrades with a payback period of six years or less.<sup>147</sup> Installations of efficient lighting (including street lights), efficient appliances and equipment, and adoption of energy efficiency practices can all reduce energy use and therefore pressure on infrastructure while saving money.

143 IEA, Closing Oil Stock Levels in Days of Net Imports, (last updated 12 August 2014), [www.iea.org/netimports/](http://www.iea.org/netimports/)

144 ACIL Tasman for the Australian Government Department of Resources Energy and Tourism, 2013, *Energy Efficiency Opportunities Program Review; Energy Efficiency Opportunities End of First Full Five Year Cycle Evaluation – Final Report*, Canberra

145 IEA, 2013, *Energy Efficiency Market Report 2013*, Paris

146 RICS, 2013, *Choosing and Managing an Energy Efficient Space: A Best Practice Guide for SME Commercial Office Tenants*, Sydney

147 Apple and Pear Limited Australia, 2014, Watts in Your Business, [www.apal.org.au/watts-in-your-business](http://www.apal.org.au/watts-in-your-business)

Energy efficiency savings can be substantial. The IEA has calculated that since 1974, energy efficiency has saved IEA member countries the equivalent of 65 per cent of total final energy consumption in 2010.

The IEA also estimates there remains potential for new energy efficiency measures to reduce global energy consumption by a further seven per cent by 2020, which is greater than the combined 2013 energy supply of Australia, Japan, Republic of Korea and New Zealand. Doing so would save consumers around the world some USD 458 billion.<sup>148</sup>

More efficient use of gas by large energy users and commercial building owners could help with gas supply shortages and users' energy costs as well. For large industrial energy users, natural gas is the main fuel type (34 per cent) followed by electricity (17 per cent), diesel (14 per cent) and coal (eight per cent).<sup>149</sup>

ClimateWorks Australia identified up to 210 PJ of energy savings potential in the Australian industrial sector in 2010–11, representing 10.7 per cent of total energy use, which equates to annual financial savings of \$3.1 billion (2010 real dollars). Almost 50 per cent of these potential energy savings (104 PJ) involve gas use within the manufacturing and mining sectors. Companies within these sectors indicated that they had adopted or were implementing 39 per cent (41 PJ) of identified gas savings, resulting in an estimated cost saving of approximately \$158 million. The majority of savings across all energy types and industry sectors involved operational process improvements (67 per cent) and the remaining involved capital upgrades (33 per cent).<sup>150</sup>

At a household scale, energy productivity is about improving utility and amenity gained from the energy used, as well as lowering energy costs. Normal household space heating and cooling, refrigerators and personal transport are among the areas where household energy productivity might be improved. Better energy productivity allows households to better manage costs by reducing the cost of meeting current expectations by using less energy, or if desired, to increase amenity while using the same amount of energy. Over the past decades, energy productivity improvements have happened in parallel with increases in home comfort, size and amenity. For example, modern homes can consume 29 per cent less electricity than homes built 10 years ago.<sup>151</sup> Refrigerators today use less than two thirds of the energy of those made 20 years ago, and they are bigger, better and no more expensive than the old ones.<sup>152</sup>

Energy productivity can be achieved through a mix of voluntary, regulatory and information measures. The AER's 'Energy Made Easy' initiative is an example of information being provided to encourage voluntary action.<sup>153</sup> Another example of an information measure is the Australian Government's Energy Rating App, which adds purchase price, electricity tariff and running costs together to give the full life-cycle costs of major household appliances.<sup>154</sup> Regulatory measures include building codes, labelling, minimum energy performance standards and mandatory disclosure.

The *Greenhouse and Energy Minimum Standards (GEMS) Act 2012* is an example of a regulatory approach to appliance standards that can benefit consumers through an associated reduction in energy costs (**Box 3**).

148 IEA, 2013, *Energy Efficiency Market Report 2013*, Paris

149 Australian Government Department of Industry 2013, *EEO Program- The First Five Years: 2006–11*, Canberra

150 ClimateWorks Australia, *Inputs to the Energy Savings Initiative modelling from the Industrial Energy Efficiency Data Analysis Project, Final Report, July 2012*, Melbourne

151 Australian Government Department of Industry, 2013, unpublished, internal analysis from published data provided by SP Ausnet

152 Energy Efficient Strategies on behalf of the Department of Industry, *Unveiling the Mysteries of Refrigerator Energy Consumption*, presentation to the 7<sup>th</sup> International Conference on Energy Efficiency in Domestic Appliances and Lighting, September 2013

153 Australian Government Australian Energy Regulator, *Energy made easy*, [www.energymadeeasy.gov.au](http://www.energymadeeasy.gov.au)

154 Council of Australian Governments, *Equipment Energy Efficiency Program*, [www.energyrating.gov.au](http://www.energyrating.gov.au)

**Box 3:** The GEMS Act — an example of rationalised and effective regulation

The Equipment Energy Efficiency (E3) Program is implemented under national legislation, the GEMS Act 2012. Standards have been agreed covering products in the residential, commercial, and industrial sectors. More than seven million appliances sold in 2013 (including refrigerators, air conditioners and televisions) carried the familiar energy rating label.

The E3 Program improves the efficiency of gas and electric appliances and equipment in Australia and New Zealand by setting standards so they use energy more productively. In doing so, E3 reduces energy costs for households and businesses, while cutting greenhouse gas emissions in a cost-effective way. It seeks to match standards with comparable requirements set by major trading partners, where there is shown to be a net economic benefit.

GEMS commenced as a national scheme in 2012, replacing seven inconsistent state-based schemes. GEMS provides a level playing field for products that meet the set standards, and removes the most inefficient products from the market. The Australian Government, states and territories (but not the Northern Territory), and New Zealand are members of the E3 Program.

Between 2000 and 2013, the estimated net savings of the E3 Program to households and businesses is over \$10 billion in avoided energy costs, or approximately 314 PJ of energy. Over the next 15 years, the projected net savings of E3 is over \$50 billion in avoided energy costs, or over 2,000 PJ of energy. In this period, the program is also projected to reduce greenhouse gas emissions by 433 Mt, at a cost of minus \$133 per tonne. For every \$1 spent under the program, the community saves \$4.60.

Extensive consultations have been under way with industry to identify opportunities to reduce the red-tape burden on businesses and streamline the implementation of the E3 Program and the GEMS Act. A number of reforms have already been implemented, and an independent review of the E3 Program and Act is being undertaken over the six months to December 2014. This will involve extensive qualitative research and consultations with all stakeholders. Consultations with industry and consumer groups on the E3 work plan will also be strengthened in 2014–15.

*The Australian Government could consider raising the minimum efficiency standards of appliances under the GEMS Act 2012. The Government could also consider introducing a scheme to recognise market leaders in energy efficient products.*

Vehicle efficiency can be achieved through a mix of all three types of measures. The Green Vehicle Guide and mandatory labelling give consumers information on car fuel efficiency. There is also potential to make the current vehicle fleet more fuel efficient. Further efficiencies could come from vehicle efficiency standards or targets for products entering the Australian market. Mandatory standards are in place in 70 per cent of the global light vehicle market, including the European Union, the United States, Canada, Mexico, Brazil, Japan, China and Republic of Korea.<sup>155</sup>

More efficient vehicles could reduce Australia's liquid fuel use, emissions and running costs. Any increase in the purchase cost of more efficient vehicles would typically be offset by the reduction in fuel costs.

A national focus on energy productivity can ensure that energy needs are met in the most efficient way, looking across both the supply and the demand sides of the economy.

155 Australian Government Climate Change Authority, 2014, *Light Vehicle Emissions Standards for Australia Research Report June 2014*, Canberra



*A comprehensive national approach to energy productivity could be achieved through a National Productivity Plan that includes:*

- *increasing appliance minimum energy performance standards on a continuous improvement basis, including a focus on standby power and peak demand*
- *considering more consistent national regimes for energy efficiency standards, including buildings*
- *ensuring best practice information on energy management and use is widely available*
- *encouraging market driven productivity through labelling and accessible information*
- *rewarding innovation by recognising market leaders in energy efficient products*
- *directly driving productivity by aligning with international energy efficiency standards, raising domestic standards and introducing new standards for appliances covered under the GEMS Act 2012*
- *strengthening international cooperation on energy productivity to share best practice and foster technology exchange*
- *improved vehicle energy efficiency.*

## Develop a better ‘outlook’ capacity

The Australian Government needs to be forward-looking and responsive to emerging security, technology and resources issues. Various periodic assessments cover each of these issues.

BREE evaluates energy supply technologies in its AETA.<sup>156</sup> Understanding technology costs and development progress helps government target support measures to maximise future energy choices. The 2013 AETA found renewable technologies generally have higher full life-cycle (levelised) costs of energy (LCOE) than the lowest cost non-renewable technologies. The exception is wind-based generation, which is estimated to already have a lower LCOE than many new-build fossil fuel generation technologies. The LCOE of solar PV is expected to become lower than the non-renewables from mid-2030 onwards. However, caution should be used with these findings as emissions reductions policy has changed since the report was published.<sup>157</sup> The next edition is scheduled for 2015.

The Australian Government expects to release an inaugural ALFTA in 2014. The publication by BREE, with support from the Australian Renewable Energy Agency (ARENA), will analyse the life cycle costs of a range of liquid fuel technologies.

Geoscience Australia, with BREE, publishes the AERA, which gives a detailed picture of Australia’s energy resources. The 2014 edition found that Australia has enough energy resources to meet domestic and increased export demand for coal and gas, and uranium exports for over the next 20 years and beyond. There is strong potential for further growth of the resource base through new discoveries. Identified resources of crude oil, condensate and LPG are more limited.<sup>158</sup>

Governments also undertake data-gathering (pre-competitive geoscience and regulatory reporting) to have a broad understanding of the extent of resources. Geoscience Australia provides maps, databases and information systems, and manages shared standards and data services for government, industry and the research community. The ability to easily collate and share spatial information encourages resource exploration, and agricultural and environmental management.

In 2012, BREE published an Australian Bulk Commodity Exports and Infrastructure Outlook to 2025. The outlook assessed whether there will be sufficient infrastructure to support exports. Port infrastructure in the pipeline is expected to meet demand, as is rail. By 2020, however, there may be constraints in gas pipeline capacity.<sup>159</sup>

<sup>156</sup> BREE, 2013, *Australian Energy Technology Assessment 2013 Model Update*, Canberra

<sup>157</sup> A carbon price is not included in the estimates. The estimates best illustrate potential and relative ‘off-the-shelf’ cost competitiveness rather than a firm predictor of market outcomes or the commercial viability of individual projects.

<sup>158</sup> Geoscience Australia and BREE, 2014, *Australian Energy Resources Assessment Second Edition*, Canberra

<sup>159</sup> BREE, 2012, *Australian Bulk Commodity Exports and Infrastructure — Outlook to 2025, July 2012*, Canberra

This supply side information is complemented by demand side information produced by AEMO on electricity and gas demand forecasts.

The Australian Government monitors energy security through the NESA. The NESA is a forward-looking assessment of the adequate, reliable and competitively-priced delivery of Australia's liquid fuel, gas and electricity. It identifies and analyses the vulnerabilities and main factors challenging the delivery of energy to end users. The next NESA is planned for 2015.

Australia would benefit from a better energy 'outlook' capacity through regular and coordinated preparation and publication of the NESA, AETA, AERA, ALFTA and infrastructure reviews. This will allow earlier and clearer identification of emerging issues. Combined, they will provide regular and comprehensive energy outlooks.

*The Australian Government will better coordinate energy sector reporting and consolidate findings in regular 'outlooks' to give a more forward-looking view of threats and opportunities to security of supply.*

## Preparing for future energy sources

Diversity in energy sources gives Australia flexibility in future energy choices, and the capability to respond to the conditions of the day, while also reducing emissions. Australia has comparative advantages in zero and low emissions technologies, such as local research expertise and abundant renewable energy and fossil energy sources. Research and development into low emission energy technologies can have spill-over benefits. For example, the adaptation of imported energy technologies to Australian conditions can reduce the cost of future adoption for other local businesses.

### Renewable energy

Renewable energy produces 13.1 per cent of Australia's electricity supply, dominated by hydro generation.<sup>160</sup> Large-scale renewable energy technologies, with the exception of wind, hydro and solar, are currently not commercially deployed. Wind output can be reasonably forecast but may not match the market demand and may therefore require additional back-up generation. The RET is the primary mechanism to support proven and commercial technologies to compete in the market. It does not assist pre-commercial technologies. The Australian Government will soon announce its response to the independent review of the RET.

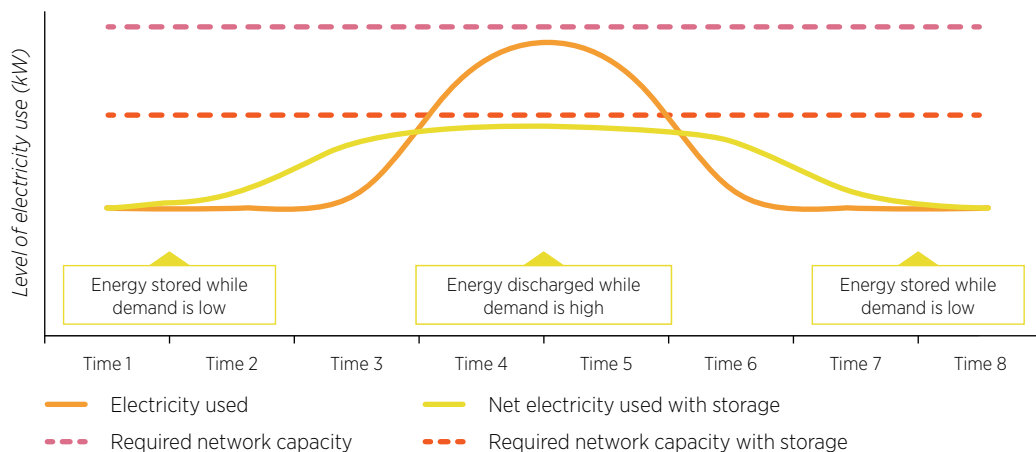
The costs of wind and solar PV technologies continue to fall.<sup>161</sup> Other renewable technologies, such as solar thermal, marine and geothermal, may enter the Australian market over time. Opportunities for more large-scale hydro power are limited, but there is potential for more mini and micro-hydro. Pumped hydro is the only currently applied large-scale storage technology, but there are very limited opportunities for its expansion.

Renewable energy technologies diversify the sources of electricity generation. Developing cost-effective energy storage would allow renewable generators to smooth their variable supply into the grid (**Figure 12**), thereby increasing the reliability of renewable energy supply.

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<sup>160</sup> BREE, 2014, *2014 Australian Energy Statistics Update*, Canberra

<sup>161</sup> BREE, 2013, *Australian Energy Technology Assessment 2013 Model Update*, Canberra

**Figure 12: Managing peak demand using energy storage**

Source: Marchment Hill Consulting, 2012, *Energy storage in Australia*

There are often supply chain challenges in building new technology. Creating a hybrid project by adding new technology onto existing fossil fuel plants can cut costs by using existing steam turbines, grid connection and transmission lines. In off-grid areas, investing in hybrid renewable generation can relieve the need for expensive network infrastructure connecting remote areas to the electricity grid, and is cost-competitive where diesel generation costs can be high.

*The Australian Government supports research and development, demonstration and pre-commercial deployment of renewable energy technology relevant to Australia. Over \$1 billion will be spent on renewable research, demonstration and deployment projects.<sup>162</sup>*

*ARENA supports the development, demonstration, and early stage deployment of a wide range of renewable energy technologies and activities to capture and share knowledge. ARENA's work includes targeted opportunities in off-grid and fringe-of-grid locations where renewables are more cost-competitive. It has also focussed on grid integration issues to remove barriers to introducing renewables into the energy market. ARENA also co-invests in early-stage Australian renewable energy companies. The Clean Energy Finance Corporation invests using a commercial approach to overcome market barriers and mobilise investment in renewable energy, energy efficiency and low emissions technologies. The Australian Government has announced that it will abolish both these agencies, but maintain a commitment to existing projects.*

## Low emissions fossil fuel

The IEA forecasts that fossil fuels will continue to provide a significant share of global stationary energy generation, largely driven by economic growth in emerging economies such as China and India.<sup>163</sup> As the second largest exporter of thermal coal and a rapidly growing exporter of LNG, Australia is an important fossil fuel supplier to the world market.

Natural gas is less emissions-intensive than coal or petroleum, and already supports a range of end uses in Australia, including manufacturing, mineral processing, electricity generation, transport and households. Low emissions fossil fuel technology, including fugitive coalmine methane emissions abatement technology, can further reduce emissions domestically and provide Australia with jobs and export technology. Australian-developed ventilation air methane capture and use technologies at coal mines have the potential to significantly reduce methane emissions at comparatively low cost. The development, demonstration and deployment of coal combustion technology such as High Efficiency Low Emissions (HELE) generation technologies, including the CSIRO-developed Direct Injection Carbon Engine, to improve generation efficiency and carbon capture and storage (CCS) to reduce CO<sub>2</sub> emissions, is also critically important in Australia's key markets.<sup>164</sup>

<sup>162</sup> Australian Government, 2014, *Independent panel review of renewable energy target*, media release, 28 August, Canberra

<sup>163</sup> IEA, 2013, *World Energy Outlook 2013*, Paris

<sup>164</sup> Direct Injection Carbon Engine (DICE) is a promising HELE technology developed by CSIRO. DICE involves converting coal or biomass into a water-based slurry that is directly injected into a large, specially adapted diesel engine.

CCS is an important part of the portfolio of technologies needed to reduce emissions from generating heat, steam or pressure from fossil fuels for electricity production and industrial processes. There are now 21 large-scale projects either in operation or under construction around the world. This includes the first large-scale projects in the power sector in Canada and the United States.<sup>165</sup>

Australia's first operating CCS project, Chevron's Gorgon LNG project, aims to begin storing approximately 3.4–4 Mt of CO<sub>2</sub> underground each year from 2016. The Gorgon project will be the world's largest CO<sub>2</sub> storage project. The CarbonNet and South West Hub projects are investigating the potential for establishing a large-scale CCS capture, transport, and storage network in Victoria's Latrobe Valley and the south west of Western Australia respectively. This builds on an internationally significant demonstration of oxyfuel technology at the Callide A power station in central Queensland.<sup>166</sup>

The commercial availability of low emission technologies would support global efforts to reduce greenhouse gas emissions and the case for continued financing of fossil energy projects in developing economies. The support of donor institutions will be critical for the demonstration and deployment of low emissions fossil energy technologies in developing countries. The decision of the World Bank in 2013 to only fund coal-fired power plants in rare circumstances underscores the importance of investing in lower emissions technologies.<sup>167</sup> A similar restriction has been adopted by the European Investment Bank and the European Bank for Reconstruction and Development. These restrictions mean that recipient countries are limited in their ability to access finance for least cost energy technologies. This has implications for the future economic growth potential of less developed economies. These restrictions may also rule out future financing for commercially available CCS technologies.

*The Australian Government funds a range of activities to reduce emissions from the combustion of fossil fuel and from coalmines. The Coal Mining Abatement Technology Support Package is supporting industry efforts to develop technologies and processes that provide future solutions to safely reduce fugitive methane emissions.*<sup>168</sup>

*The Australian Government is currently funding over \$247 million of CCS work, particularly in the area of making Australia CCS-ready by proving up storage sites. Australia is regarded as a world leader in CO<sub>2</sub> storage monitoring and verification technology, in particular through the Otway project managed by the Cooperative Research Centre for Greenhouse Gas Technologies, which has injected and stored over 65,000 tonnes of CO<sub>2</sub>. Australia also has world-leading capabilities in a range of different capture technologies that will be critical to reducing the currently high costs of CCS.*

## Nuclear energy

Australia is a major exporter of uranium, but does not use nuclear power, which is a reliable source of low emissions baseload electricity for many countries, generating 11 per cent of the world's electricity.

Community attitudes to the export of uranium are changing. In 2012, the Queensland Government repealed a ban on uranium mining and the New South Wales Government repealed a ban on uranium exploration. In South Australia, the main source of uranium exports, 48 per cent of the community support nuclear power while 33 per cent oppose it.<sup>169</sup>

A report to the Australian Government by the Uranium Mining, Processing and Nuclear Energy Review Taskforce in 2006 identified the main barriers to deploying nuclear energy in Australia as skills shortages, government policies, and legal prohibitions. The cost of the technology and waste disposal were also seen as challenges.<sup>170</sup> The main barriers, however, remain even though there has been considerable progress in the management of risks and advances in technology (**Attachment 3**).

<sup>165</sup> Global CCS Institute, Global Status of CCS 2014, <http://www.globalccsinstitute.com/publications/global-status-ccs-february-2014>

<sup>166</sup> Global CCS Institute, Browse projects, [www.globalccsinstitute.com/projects/browse](http://www.globalccsinstitute.com/projects/browse)

<sup>167</sup> World Bank. 2013. *Toward a sustainable energy future for all: directions for the World Bank Group's energy sector*, Washington DC

<sup>168</sup> Australian Government, *Portfolio Budget Statements 2014–15 Budget Related Paper No. 1.12 Industry Portfolio*, Canberra

<sup>169</sup> 2014, South Australian Chamber of Mines and Energy, *South Australian Attitudes on Uranium and Nuclear Power*, Adelaide

<sup>170</sup> Report to the Prime Minister by the Uranium Mining, Processing and Nuclear Energy Review Taskforce 2006, *Uranium Mining, Processing and Nuclear Energy – Opportunities for Australia?*, Canberra

Since the Three Mile Island (1979) and Chernobyl (1986) disasters, the nuclear industry has standardised its operating procedures and developed new reactor designs that are safer, more efficient, and produce lower volumes of radioactive waste.<sup>171</sup> The reactors involved in the Fukushima (2011) disaster are of an early 1960s design. The main development in technology since 2006 has been further work on Small Modular Reactors (SMRs). SMRs have the potential to be flexibly deployed, as they are a simpler ‘plug-in’ technology that does not require the same level of operating skills and access to water as traditional, large reactors. SMRs may be well suited to regional and remote areas as a source of off-grid energy.

Australia has around 8 per cent of the world’s identified thorium resources.<sup>172</sup> Thorium is a nuclear fuel source with the potential to be an alternative to uranium. A number of challenges need to be overcome, however, before the thorium fuel cycle could become commercially viable. These include undertaking detailed development work on a suitable reactor type, further investment in thorium fuel development, and more experience in working with thorium fuel to ensure safety and informed regulation. There are several international projects developing thorium as a power source. The Shanghai Institute of Applied Physics is building a small thorium molten salt reactor, which it hopes to operate in 2015. ANSTO is working with the Shanghai Institute to develop advanced materials for use in the reactor. Meanwhile Norwegian company, Thor Energy, is experimenting with thorium-plutonium oxide for use in light-water reactors. The International Atomic Energy Agency (IAEA) also has a project to allow member countries to share results on thorium fuel developments.

## Next generation transport fuels

New fuel types could be used to respond to the impacts of rising global oil prices or local supply shortages. In the short-term, however, they are unlikely to be cost-competitive, and need to address low levels of consumer acceptance, technical barriers, and limited consumer service infrastructure. Large capital investment would be needed to challenge the market dominance of established fuel sources.

Advanced biofuels are liquid transport fuels produced from plant material (biomass) including algae and agricultural and forestry products. Australia has demonstrated capacity to produce biofuels, but there are significant hurdles to the expansion of production.

ARENA has invested around \$25 million to support the research, development and demonstration of advanced biofuels through projects such as a demonstration facility to produce biocrude from seaweed, and new technology to grow and convert farm-grown mallee crops into advanced biofuels.<sup>173</sup>

The use of hydrogen to power vehicles has been explored by several countries and vehicle makers around the world. Hydrogen can be produced by using steam to reform hydrocarbons such as coal, crude oil and natural gas into hydrogen and CO<sub>2</sub>. Biomass can be reformed in a similar process. Water can also be split into hydrogen and oxygen using electricity. If renewable electricity is used, such as solar or wind, then the hydrogen will be produced without any emissions. There are, however, several challenges that still need to be overcome for hydrogen to become commercially viable as an alternative transport fuel. These challenges include efficiency (producing hydrogen uses considerable amounts of energy), the cost-competitiveness of production, the transportation and storage, advances in fuel cell technology and the development of distribution infrastructure. Australian research continues in this area. For example, recent work has enhanced understanding about hydrogen, and how to get it in and out of a fuel system and stored in a manner that is stable and safe for hydrogen-powered vehicles.<sup>174</sup>

Sustainable aviation fuel is based on several processes that are globally accepted for the production of liquid fuels from various feedstocks. These are blended up to 50 per cent with conventional fuels. The processes range from the gasification of biomass, coal, and natural gas through to the hydro-processing of algal and plant oils. Research and development for a wide variety of feedstock and pathways include processes such as the conversion of alcohols to jet fuel, and sugar to hydrocarbon.

<sup>171</sup> *Ibid*, Uranium Mining, Processing and Nuclear Energy Review Taskforce

<sup>172</sup> Geoscience Australia and BREE, 2014, *Australian Energy Resource Assessment*, Canberra

<sup>173</sup> ARENA, Bioenergy projects, [www.arena.gov.au/projects/bioenergy/](http://www.arena.gov.au/projects/bioenergy/)

<sup>174</sup> ANSTO, 2014, *New molecule puts scientists a step closer to understanding hydrogen storage*, media release, 24 July, Lucas Heights

CTL technologies are being developed to convert black or brown coal to liquid products. These products can include petrol and diesel, synthetic waxes, lubricants, chemical feedstocks and alternative liquid fuels, such as methanol and dimethyl ether. CTL is also energy and emissions-intensive. Indirect liquefaction, in particular, requires large amounts of water, a significant disincentive in arid climates. The process of converting coal to liquids generates significant carbon emissions that require coupling with CCS technologies just to match the emissions from conventional liquid fuel processes.<sup>175</sup>

Gas to liquids (GTL) technologies provide another potential liquid fuel source. GTL allows for the production of a liquid fuel (petrol or diesel products) from natural gas, which can be transported in normal tankers like oil products. GTL produces clean fuels with low emissions of particulates, oxides of nitrogen and sulphur, and hydrocarbons. GTL is a potential additional solution to stranded gas resources too remote or small to justify the construction of an LNG plant or pipeline, and offers a value-added pathway to commercialisation of Australia's large, undeveloped gas reserves.<sup>176</sup>

*The Australian Government will address any identified unnecessary regulatory barriers to the greater uptake of new fuels, such as inconsistency in state and territory transport rules.*

## Research and development driving innovation

Australia has a strong record of energy technology innovation. This includes world-leading solar photovoltaic technologies, remote area power systems, petroleum exploration, oxyfuel technology, and CO<sub>2</sub> storage and monitoring.

The Australian Government is focussed on encouraging new technologies and adapting technologies to Australian conditions, improving collaboration between businesses and researchers, and promoting workforce innovation.

Energy technology research is carried out across Australia in a wide range of institutions, and with a range of funding mechanisms. For example, Australian Government support for low emissions fossil energy technology is provided collaboratively with the coal industry and state governments.

A review of the alignment of research funding for energy technology activities to strategic priorities should be part of normal review cycles.

*As energy options and policy challenges emerge and change over time, it will be vital that Australia has a flexible research system that can be mobilised, focused and redirected to meet new research priorities. Improved science advisory mechanisms will provide a means to better coordinate various sectors of the research system. The advisory structures should assist the Australian Government to take stock of the existing research and ensure that important challenges are being addressed by sufficient research effort.*

## Proactive regulation to support new technologies

Regulation must keep pace with anticipated changes in technology and market conditions, but not impede industry development.

Australia has developed regulation or regulatory frameworks to support new technologies such as unconventional gas exploration and development, CCS, geothermal and marine energy. Creating these regulatory frameworks, and the knowledge and capacity to enforce them, enables rapid adoption of new technologies as they become viable.

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<sup>175</sup> World Coal Association, *Coal to Liquids*, [www.worldcoal.org/](http://www.worldcoal.org/)

<sup>176</sup> Geoscience Australia and BREE, 2012, *Australian Gas Resource Assessment 2012*, Canberra

## Unconventional gas

The expansion of unconventional gas developments such as CSG and shale gas requires regulation that gives the community confidence that risks are appropriately identified and managed. Risks to groundwater associated with hydraulic fracturing techniques are an example. Any regulation should be consistent with the principles of the National Water Initiative, which takes a national approach to Australia's water resources. Regulation should also provide certainty to project developers and investors, and be as nationally consistent as possible.

*In May 2013, all governments endorsed principles of leading practice regulation for CSG, which are set out in the National Harmonised Regulatory Framework for Natural Gas from Coal Seams. Ongoing regulatory development and harmonisation will be necessary to facilitate the further development of unconventional gas resources in Australia.*

## CCS

CCS involves the capture of CO<sub>2</sub> from the source of emission, such as a power station, and the transport of the CO<sub>2</sub> to a geological storage site where it is permanently stored deep underground. As capture and transport of CO<sub>2</sub> are common practices, new regulation is most likely to be needed for the storage of CO<sub>2</sub>, including, in particular, providing community assurance in relation to any long-term liability issues associated with storage.

*Regulatory frameworks for CCS in Australia are well advanced. All interested jurisdictions now have CCS legislation either in place or in the process of passage through Parliament, along with the development of underpinning regulations. As a result, early-mover, large-scale projects are underway. Australia is also active in national and international CCS standards development. Australia is contributing to the development of new International Organization for Standardization standards on key activities for CO<sub>2</sub> capture, transportation and geological storage.*

## Nuclear

Australia has regulations in place covering the Lucas Heights research nuclear reactor in New South Wales and radioactive waste management, and physical protection and IAEA safeguards on nuclear material, equipment and activities. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) regulates the safe and secure use of radiation sources by Australian Government entities. The Australian Safeguards and Non-Proliferation Office (ASNO) regulates physical protection and IAEA safeguards requirements on nuclear material, equipment and activities. ANSTO is responsible for delivering specialised advice, scientific services and products to government, industry, academia and other research organisations. Ongoing investment in the nuclear regulatory framework, and further development of Australia's nuclear knowledge and skills, will underpin future regulatory capability if required.

*At present, legislation prevents the development of an Australian domestic nuclear energy industry. Removing legislative barriers to Australia using nuclear power for electricity, when there is an economic case for its deployment, would include amending the Australian Radiation Protection and Nuclear Safety Act 1998 and the EPBC Act to allow construction or operation of nuclear fuel plants.*

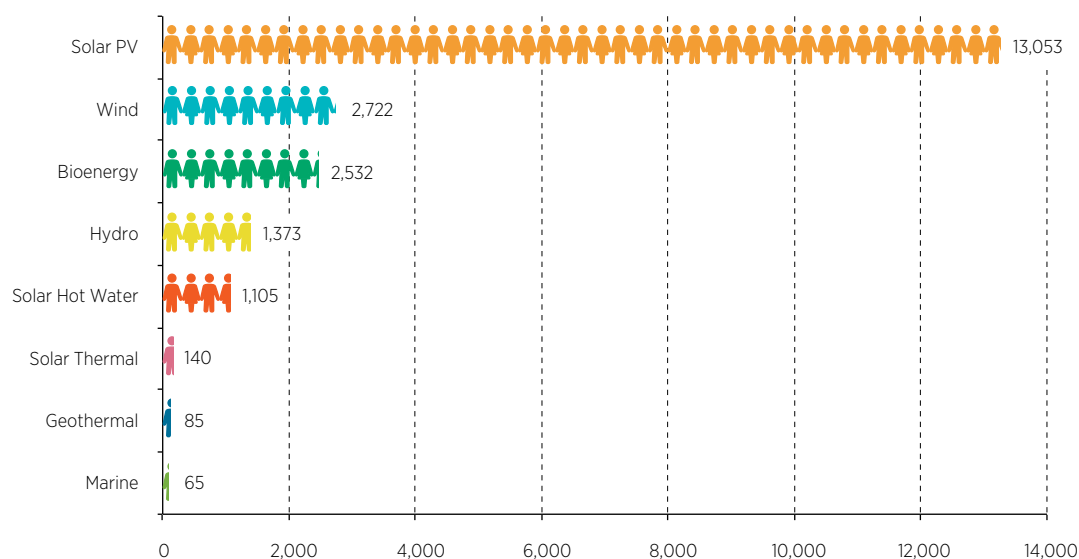
*The Australian Government will review the current regulatory framework that governs nuclear and waste facilities to remove any duplication and streamline regulations.*

## Skills

The right skills and workforce capacity are needed to meet domestic and global demand for new energy technologies. There is an opportunity to assess the current and future workforce requirements of the energy technology sector as there is little information on the number of people engaged in energy technology research and development.

Relevant data is available for the renewable energy sector, which suggests that workforce requirements can respond rapidly in some situations. The sector has grown significantly over the past decade, from 6,200 employees in 2008 to almost 21,000 employees in 2013, excluding people employed in organisations undertaking renewables-related research and development.<sup>177</sup> Consumer uptake of solar technologies is the key driver behind the significant employment growth over the past five years. In 2013, over 60 per cent of the workforce was engaged in solar technology (Figure 13).

**Figure 13:** Employment within Australia’s renewable energy sector



Source: Clean Energy Council, 2014, *Clean Energy Australia Report 2013*, Melbourne

Ensuring that the entities managing and regulating Australia’s energy markets have the requisite skills to cost-effectively manage all energy sources and new energy technologies is also critical as Australia moves towards a more diverse energy mix.

*The \$476 million Industry Skills Fund will help Australian industry access training and support services, and develop innovative training solutions so Australia will have the highly skilled workforce it needs to adapt to new business growth opportunities, rapid technological change and market-driven structural adjustment. The fund will provide up to 200,000 training places and support services over four years. The fund will commence on 1 January 2015.<sup>178</sup> Improving workforce skills is a key part of the Australian Government’s Industry, Innovation and Competitiveness Agenda.*

177 Clean Energy Council, 2014, *The Clean Energy Australia Report 2013*, Melbourne

178 Australian Government Budget 2014–15, *Budget measures, Budget Paper No. 2 2014–15*, 13 May 2014, The Treasury



## International collaboration

International engagement allows Australian industries to benefit from international experience in developing energy technologies such as HELE coal generation, SMRs, renewable energy, and energy storage.

Australia has access to technology developments and the results of international collaboration in energy technology through its membership of the IEA, which promotes the development and deployment of energy technologies through 40 Implementing Agreements. These bring together experts from different countries to work and share results. By participating in Implementing Agreements, Australia is able to share the cost of research, pool scientific and technical results, access the expertise and training of foreign participants, and demonstrate Australian expertise and skills. Australia is currently a member of Implementing Agreements covering renewable energy, fossil fuels, energy end use, energy efficiency, and fusion power.

The benefits of adapting international technologies can be realised through bilateral and multilateral engagement with other governments and foreign firms, including joint research and demonstration projects. Costs and benefits are shared among local and international collaborators.

*The Australian Government supports the Australia–China Science and Research Fund, which includes new funding to establish Joint Research Centres to apply and commercialise research on oil and gas, mining, and mining services. Australia also enjoys strong bilateral partnerships such as the Australia China Joint Coordination Group on Clean Coal Technology. The Group has fostered collaboration between government, industry and research institutions on CCS technology, including the development of a large-scale demonstration project in China, and knowledge transfer on geological storage assessments.*

*The Australian Government also supports international collaboration on solar research through a number of research and development projects managed by ARENA.*

Australia is engaged in many international fora collaborating on energy technology. These include the IEA, the Clean Energy Ministerial, the Asia Pacific Economic Cooperation Energy Working Group, the East Asia Summit Energy Cooperation Taskforce, the International Partnership for Energy Efficiency Cooperation, the Carbon Sequestration Leadership Forum, and the International Renewable Energy Agency. Australia will continue to encourage the rationalisation of the activities of these bodies to remove duplication and to focus on ensuring rapid adoption of technology.

*The Australian Government is currently reviewing its level of international engagement on energy technology with a view to rationalising it, where appropriate. Australia's international effort should seek to shape international energy policy on strategic energy technology topics to support global growth and Australia's trade and investment objectives. This engagement should ensure that international agreements do not impose barriers on the development and deployment of, or the trade in, energy technology.*

## Feedback sought

The Government seeks comments on ways the Goals set out at the beginning of this chapter could be achieved.

Below is a brief summary of the actions outlined in this chapter that the Australian Government is either currently pursuing, or which are proposed, to achieve the Goals in this chapter.

- **Secure and reliable energy supplies**

*The Australian Government will keep the standards and measurement capability needed for efficient markets. To continue reliable access to energy, the Australian Government monitors and identifies emerging issues through periodic NESAs. Response mechanisms are available to industry and government to deal with unanticipated supply disruptions.*

- **Improving energy productivity**

*The productive use of energy has environmental and economic benefits. A national approach to energy productivity, covering energy production and use for both stationary and transport energy, could deliver enhanced security of supply, respond to rising electricity and gas prices, and deliver emissions reductions.*

- **Develop a better outlook capacity**

*The Australian Government currently assesses energy supply and use issues through the AERA, AETA and NESAs. Better coordination of this reporting and consolidation of findings will give a more coordinated forward-looking view of threats and opportunities to security of supply.*

- **Keep future energy technologies open**

*The Australian Government is actively identifying and removing unnecessary regulation. Regulation should be forward-looking so as not to slow the adoption of new technologies.*

*The Australian Government is supporting the demonstration and deployment of low emissions technologies. This includes investing over \$1 billion in renewable energy and over \$300 million in low emissions fossil fuel technology.*

*The Australian Government is investing \$476 million in the Industry Skills Fund to help Australian industry access and develop innovative training solutions so Australia will have the highly skilled workforce it needs.*

- **Technology collaboration**

*The Australian Government has a focus on encouraging new technologies or adapting technologies to Australian conditions, improving collaboration between businesses and researchers, and promoting workforce innovation. The Australian Government supports energy-related research and development. It proposes to better target this work through setting national research priorities and reviewing the level of international technology collaboration engagement.*

# Attachments

## Attachment 1: The Energy White Paper Terms of Reference

*The Australian Government has committed to a set of signature economy-wide reforms to grow the economy while addressing rising business and household costs. The Australian Government is committed to working closely with industry and state and territory governments in developing an integrated, coherent national energy policy.*

*Australia's energy production, distribution and use are undergoing major transformations, including: changes in our domestic and international markets; our primary energy resources and generation technologies; and in how consumers source and use energy. Priority outcomes for the Government include addressing cost-of-living pressures and business competitiveness, with both requiring competitive pricing, productive and efficient use of energy, and reform of regulation.*

*Securing our long-term domestic energy needs, maintaining international competitiveness while meeting international obligations, and growing our export base are fundamental to a strong economy. Growing exports of energy products will bring benefits to Australia, but add to competition for Australian energy resources and link domestic energy prices more closely to international markets. These challenges will require flexible and efficient energy markets.*

*This Energy White Paper will outline a coherent, integrated and efficient regulatory and policy framework, stimulating sustainable growth, building community confidence in environmental safeguards and growing investment in the energy sector. This will maintain downward pressure on costs while delivering greater certainty and security in supply. Complementing Direct Action, the Energy White Paper will also consider lower emissions energy and the more productive and efficient use of energy.*

*The Energy White Paper will consider:*

- *policy and regulatory reform to secure reliable, competitively and transparently priced energy for a growing population and productive economy, including the efficiency and effectiveness of regulatory bodies;*
- *the appropriate role for government in the energy sector*
- *opportunities to drive the more productive and efficient use of energy*
- *energy related distribution infrastructure to deliver efficient national markets*
- *alternative transport fuel sources*
- *workforce issues, including national skills development needs*
- *emerging energy technologies and new energy sources*
- *future growth in exports of energy products, including our world leading services industries.*

*The Energy White Paper will be led by the Department of Industry. An Issues Paper will be released by mid December 2013 to initiate consultation. A Green Paper will be released for consultation in May 2014. The Energy White Paper will be completed in September 2014.*

## Attachment 2: Timeline of regulatory changes to state, territory and Australian Government management of electricity and gas supply

The competition reforms of the 1990s transformed Australia's electricity and gas sectors. Reforms included: separating the previously vertically integrated supply chain; introducing competition between generators and between retailers; bringing the network under access and price regulation and creating the National Electricity Market (NEM). Gas laws limiting interstate trade were repealed and third party access to pipelines was mandated. These reforms resulted in a 19 per cent fall in average real electricity prices nationwide. Reforms in key infrastructure sectors in the 1990s conservatively increased GDP by 2.5 per cent (equivalent to \$20 billion in 2005).

In 1992, the Council of Australian Governments (COAG) agreed on the need for a national competition policy for Australian industries, including electricity and gas, and commissioned an independent inquiry. In 1993, the Independent Committee of Inquiry into National Competition Policy released its final report, the Hilmer Report. Its recommendations were intended to allow private firms to compete in many government-dominated sectors, including energy.

In 1994, COAG agreed to the competition policy principles of the Hilmer Committee report and endorsed: the Competition Principles Agreement; the Conduct Code Agreement; and the Agreement to Implement the National Competition Policy and Related Reforms. These agreements set out a comprehensive nationally coordinated microeconomic reform programme (the National Competition Policy).

The National Electricity Objective was established under the *National Electricity (South Australia) Act 1996* to "promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to: price, quality, safety, reliability and security of supply of electricity; and the reliability, safety and security of the national electricity system".

In 1997 the *Gas Code Gas Pipelines Access (South Australia) Act 1997* established third party pipeline access arrangements (including prices and access terms) to be agreed by the regulator, excluding transportation functions.

In 1998, the NEM combined Queensland, New South Wales, the Australian Capital Territory, Victoria and South Australia into one market. The monopoly public electricity utilities were separated into competing generation, transmission, and distribution and retail businesses, though not fully privatised. Tasmania joined the NEM in 2005, connecting Tasmania to the mainland via a Direct Current high voltage transmission cable. The NEM enabled competition in the generation and retail sectors.

In 2001, COAG agreed to a national energy policy framework to guide future energy policy decision-making, and provide increased certainty for energy users. COAG also agreed to commission an independent review of the strategic direction for stationary energy market reform in Australia.

In 2002, the independent report to COAG, *Towards a Truly National and Efficient Energy Market* (the Parer Review), identified strategic issues for Australian energy markets and proposed policy directions. These reforms were intended to overcome deficiencies in the energy market. These deficiencies included: issues of governance and regulation; transmission; financial market development for electricity; concerns about upstream gas market competition and barriers to building new gas pipelines. The Parer Review also proposed changes to the institutional governance arrangements that apply to the energy sector, including creating a national energy regulator. Further information about the Parer Review is in the table below.

In 2004, COAG entered into the Australian Energy Market Agreement (AEMA), to give effect to the major energy market reform programme proposed by the then Ministerial Council on Energy, drawing on the Parer Review. The reform programme addressed institutional governance arrangements, provided greater

regulatory consistency, and an independent regulator accountable to all jurisdictions. It also accelerated the development of a reliable, competitive and secure natural gas market.

In 2005, the Australian Energy Market Commission (AEMC) and the Australian Energy Regulator (AER) started and the National Electricity Rules replaced the National Electricity Code under the National Electricity Law.

In 2005, the Western Australian Wholesale Electricity Market introduced a capacity mechanism to incentivise investment in sufficient capacity for the South West Interconnected System (SWIS). In 2006, Western Australia's electricity industry was separated into four government owned entities: Verve Energy (generation in the SWIS); Western Power (transmission and distribution networks in the SWIS); and Synergy (retail) in the SWIS; and Horizon Power (rural supply) in the North West Interconnected System.

In 2006, COAG established the Energy Reform Implementation Group (ERIG), to review parts of Australia's energy sector and suggest any further reforms needed to deliver more efficient energy markets. In its January 2007 report, Energy Reform The way forward for Australia, ERIG reported on a range of reform priorities, including privatisation, retail, price deregulation, more market contestability, improved transmission planning and regulation, and facilitating efficient financial markets. In 2007, in response to the ERIG Review's priority reforms, COAG "agreed that any decision on privatisation or disaggregation initiatives is a matter for individual governments".

COAG, in its 2006 amendments to the AEMA, committed to remove retail energy price regulation where there is effective competition. Only South Australia and Victoria have done this. The New South Wales Government considers there is effective competition in both electricity and gas markets in that state, and has announced it will deregulate electricity prices from 1 July 2014. Queensland is making similar moves, by announcing it will remove price regulation for south east Queensland customers on 1 July 2015, subject to certain consumer protections.

In 2008, the National Gas Law and subordinate National Gas Rules started, regulating natural gas pipelines in the eastern states under a national energy framework. The National Gas Objective was established under the *National Gas (South Australia) Act 2008* to "promote efficient investment in, and efficient operation and use of, natural gas services for the long-term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas".

In 2009, the Australian Energy Market Operator (AEMO) was established to operate gas and electricity markets in southern and eastern Australia. A new short-term trading market in gas was progressively launched from 2010 in Sydney, Adelaide and Brisbane. The National Gas Market Bulletin Board started, providing real-time information on the state of the gas market, on system constraints and on market opportunities.

On 1 January 2014, the Western Australian Government remerged the state-owned electricity generator, Verve, and its retailer, Synergy, to achieve its stated objective of reducing retail prices. However, it is yet to be seen as to whether this will impact on the ability of new generation entrants to build capacity in Western Australia in the future.

On 20 March 2014, the Wallumbilla gas trading hub started in Queensland, representing the next step in the evolution of the Australian national gas markets. The gas trading hub should improve transparency and reliability of supply, creating a voluntary market with low cost and flexible trading.

In 2014 the Northern Territory Government further reformed its utilities markets, and is in the process of adopting national frameworks to promote an efficient retail energy market with appropriate customer protections. Adopting national frameworks will also help to ensure electricity network revenues reflect the efficient costs of delivering a reliable and secure electricity supply.

Governments across Australia are moving towards privatising remaining energy assets across generation, transmission, distribution and retail. Only Victoria and South Australia, however, have fully privatised.

## The 2002 Parer Review key findings

| KEY FINDINGS   | PARER REPORT EXAMPLE IMPLICATIONS   |
|--|---|
| <ul style="list-style-type: none"> <li>• The energy sector governance arrangements are confused, there is excessive regulation, and perceptions of conflict of interest.</li> <li>• There is insufficient generator competition to allow Australia's gross pool system to work as intended.</li> <li>• Electricity transmission investment and operation is flawed, and the current regions do not reflect the needs of the market.</li> <li>• The financial contracts market is extremely illiquid, in part reflecting large regulatory uncertainty.</li> <li>• There are many impediments to the demand side playing its true role in the market.</li> <li>• There is insufficient competition in the east coast gas market, and too much uncertainty surrounding new pipeline development.</li> <li>• Greenhouse responses so far are ad-hoc, and poorly targeted.</li> <li>• The NEM is currently disadvantaging some regional areas.</li> </ul> | <ul style="list-style-type: none"> <li>• Poor market development mechanisms, overlapping responsibilities, unnecessary costs, distorted signals for behaviour.</li> <li>• Too many periods of excessive generator market power and pool price volatility.</li> <li>• A 'regionalised' National Electricity Market (NEM), with five markets rather than one, and a severe limitation on trading interstate and market liquidity in general.</li> <li>• No effective short-term contract market, large users cannot obtain long-term contracts, market overall less efficient.</li> <li>• Pool prices are more volatile than they need to be, the system requires more generation capacity than it should.</li> <li>• Some prices to consumers are (or will soon become) higher than necessary, the gas market is not flexible.</li> <li>• A given greenhouse benefit is costing the community much more than it needs to.</li> <li>• Some regional areas are not attracting the investment that their resource endowment would suggest.</li> </ul> |

## Attachment 3: Nuclear energy issues

Nuclear energy accounts for around 11 per cent of the world's electricity. There are currently 435 commercial nuclear power reactors operable in 31 countries, with over 375,000 megawatts of total capacity. A further 72 nuclear power reactors are under construction, equivalent to 20 per cent of existing capacity, while 174 are firmly planned, equivalent to half of present capacity.<sup>179</sup>

Australia is a major exporter of uranium, but does not use nuclear power. Access to abundant low cost energy options, community sentiment and government policy, including legal prohibitions, have resulted in Australia not deploying nuclear power. In addition, Australia now has an overcapacity in generation, which is not forecast to disappear until 2023–24.

In 2013, the Bureau of Resources and Energy Economics found that, over the projection period to 2050, nuclear remains cost-competitive with both renewable and non-renewable technologies on a levelised cost of energy basis.<sup>180</sup>

### Nuclear safety

The main safety concern regarding nuclear power is the possibility of an uncontrolled release of radioactive material, leading to contamination and consequent radiation exposure off-site.

Following the accident at Fukushima Daiichi Nuclear Power Station in Japan, the International Atomic Energy Agency (IAEA) led a process to strengthen nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide. The IAEA Nuclear Safety Action Plan, endorsed unanimously in September 2011 by the IAEA's member states, defines a programme of work to strengthen the global nuclear safety framework.

Nuclear power plants are also designed to be safe in their operation and resilient to any malfunction or accident. The nuclear power industry globally has been developing and improving reactor technology for more than five decades. Advanced reactors now being built have simpler designs, which reduce capital cost, are more fuel-efficient, and inherently safer. Generation III+, III++ and IV full-scale reactors, and Small Modular Reactors currently under development, incorporate passive safety features that require no active controls or operational intervention to avoid accidents in the event of malfunction, and may instead rely on gravity, natural convection, or resistance to high temperatures.<sup>181</sup>

No industrial activity can be represented as entirely risk-free. However, the relative safety of nuclear power is reflected in a 2013 study commissioned by Friends of the Earth, which concluded that, "overall the safety risks associated with nuclear power appear to be more in line with lifecycle impacts from renewable energy technologies, and significantly lower than for coal and natural gas per MWh of supplied energy."<sup>182</sup>

### Disposal of waste

The nuclear fuel cycle is the series of industrial processes used to produce electricity from uranium in nuclear power reactors. Disposal is the recognised end-point for radioactive wastes created as a by-product of the nuclear fuel cycle.

At all stages of the nuclear fuel cycle, individuals, society and the environment must be adequately protected against radiological hazards. For radioactive waste, these obligations are underpinned in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, to which Australia is a signatory.

<sup>179</sup> World Nuclear Association, World Nuclear Power & Uranium Requirements, [www.world-nuclear.org/info/Facts-and-Figures/World-Nuclear-Power-Reactors-and-Uranium-Requirements](http://www.world-nuclear.org/info/Facts-and-Figures/World-Nuclear-Power-Reactors-and-Uranium-Requirements)

<sup>180</sup> BREE, 2013, *Australian Energy Technology Assessment 2013 Model Update*, Canberra

<sup>181</sup> World Nuclear Association, Advanced Nuclear Power Reactors, [www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Power-Reactors/Advanced-Nuclear-Power-Reactors](http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Power-Reactors/Advanced-Nuclear-Power-Reactors)

<sup>182</sup> Tyndall Centre report commissioned by Friends of the Earth, 2013, *A Review of Research Relevant to new Build Nuclear Power Plants in the UK*, Manchester

There is a worldwide consensus amongst technical experts that spent fuel and high level waste can be appropriately disposed of in deep geological repositories. Finland and Sweden are leading the way with this work and have made significant progress towards opening their deep geological repositories.

A full spent fuel / high level waste strategy should be included as part of any consideration for nuclear power or fuel generation.

## Non-proliferation

Australia is a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), which aims to prevent the spread of nuclear weapons and weapons technology, to foster the peaceful uses of nuclear energy, and to further the goal of disarmament. The Australian Safeguards and Non-Proliferation Office regulates physical protection and IAEA safeguards requirements on nuclear material, equipment, and activities in Australia.

The non-proliferation regime has been remarkably successful and has helped to slow proliferation.<sup>183</sup>

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<sup>183</sup> Australian Safeguards and Non-Proliferation Office, Presentation to representatives of UN Missions at the Australian Mission, New York, 8 September 2008



# Acronyms

|                      |  |
|----------------------|--|
| ABS                  | Australian Bureau of Statistics                              |
| ACCC                 | Australian Competition and Consumer Commission               |
| AEMC                 | Australian Energy Market Commission                          |
| AEMO                 | Australian Energy Market Operator                            |
| AER                  | Australian Energy Regulator                                  |
| AERA                 | Australian Energy Resources Assessment                       |
| AETA                 | Australian Energy Technology Assessment                      |
| ANSTO                | Australian Nuclear Science and Technology Organisation       |
| ASNO                 | Australian Safeguards and Non-Proliferation Office           |
| Austrade             | Australian Trade Commission                                  |
| AWPA                 | Australian Workplace and Productivity Agency                 |
| Bbl/day              | Barrels per day  |
| BREE                 | Bureau of Resources and Energy Economics                     |
| CCS                  | Carbon Capture and Storage                                   |
| CNG                  | Compressed Natural Gas                                       |
| CO <sub>2</sub>      | Carbon dioxide   |
| COAG                 | Council of Australian Governments                            |
| CSG                  | Coal Seam Gas  |
| CSIRO                | Commonwealth Scientific and Industrial Research Organisation |
| c/kWh                | Cents per kilowatt hour                                      |
| DWGM                 | Victorian Declared Wholesale Gas Market                      |
| EPBC                 | Environment Protection and Biodiversity Conservation         |
| ERF                  | Emissions Reduction Fund                                     |
| ERIG                 | Energy Reform Implementation Group                           |
| GDP                  | Gross Domestic Product                                       |
| GEMS                 | Greenhouse and Energy Minimum Standards                      |
| GJ                   | Gigajoule  |
| GSOO                 | Gas Statement of Opportunities                               |
| IAEA                 | International Atomic Energy Agency                           |
| IEA                  | International Energy Agency                                  |
| IMO                  | Independent Market Operator                                  |
| km                   | Kilometre  |
| LCOE                 | Levelised Cost of Energy                                     |
| LNG                  | Liquefied Natural Gas  |
| LPG                  | Liquefied Petroleum Gas                                      |
| MRRT                 | Minerals Resource Rent Tax                                   |
| MtCO <sub>2</sub> -e | Million tonnes of carbon dioxide equivalent                  |
| Mtpa                 | Million tonnes per annum                                     |
| NEM                  | National Electricity Market                                  |

|         |   |
|---------|---|
| NEMEMF  | National Electricity Market Emergency Management Forum                    |
| NERL    | National Electricity Retail Law   |
| NESA    | National Energy Security Assessment                                       |
| NGERAC  | National Gas Emergency Response Advisory Committee                        |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NOSEC   | National Oil Supplies Emergency Committee                                 |
| PJ      | Petajoule   |
| PRRT    | Petroleum Resource Rent Tax   |
| PV      | Photovoltaic  |
| R&D     | Research and Development  |
| RET     | Renewable Energy Target   |
| SME     | Small to Medium Enterprise  |
| SMR     | Small Modular Reactor   |
| STTM    | Short-term Trading Market   |
| SWIS    | South West Interconnected System  |
| VET     | Vocational Education and Training   |

# Glossary

**Biofuels:** Liquid fuels produced by chemical conversion processes that result in the production of ethanol and biodiesel.

**Biogas:** Landfill gas and sewage gas. Also referred to as biomass gas.

**Black coal:** Hard coal with high energy content. In Australia, anthracite, bituminous and sub-bituminous coals are referred to as black coal.

**Brown coal:** Has a low energy content and high ash content. It is unsuitable for export and is used to generate electricity in power stations located at or near the mine. Also referred to as lignite.

**Brownfield sites/projects:** Sites that already have operations in the vicinity, with established supporting infrastructure. Exploration in these areas seeks to identify additional resources.

**Coal seam gas:** Methane held within coal deposits, bonded to coal under the pressure of water. It may also contain small amounts of carbon dioxide and nitrogen. Also referred to as coal seam methane and coal bed methane.

**Crude oil:** Naturally occurring mixture of liquid hydrocarbons under normal temperature and pressure.

**Condensate:** Hydrocarbons recovered from the natural gas stream that are liquid under normal temperature and pressure.

**Conventional gas:** Generally refers to methane held in a porous rock reservoir, frequently found in combination with heavier hydrocarbons. It may contain small amounts of ethane, propane, butane and pentane as well as impurities such as sulphur dioxide, and inert gases such as nitrogen.

**Conversion:** The process of transforming one form of energy into another (derived) form before final end use. Energy used in conversion is the energy content of fuels consumed, as well as transformed, by energy-producing industries.

**Economic resources:** The quantity of resources that is judged to be economically extractable under current market conditions and technologies

**Electricity generation capacity:** The maximum electricity output of generators technically possible at a given hour. The maximum annual output from generators is equal to generation capacity multiplied by the number of hours in a year.

**Energy storage:** The physical means to store energy to be used at a later time to meet demand. Storage is commonly used in remote areas where there is no connection to the main electricity grids or where energy supply is unreliable.

**G20:** The Group of Twenty (G20) is the premier forum for its members' international economic cooperation and decision-making. Its membership comprises 19 countries plus the European Union.

**Gen-tailer:** Vertically integrated retailer and generator.

**Greenfield sites/projects:** Sites or projects located in an area that is under-explored for new potential energy resources and/or building of new supply infrastructure.

**Natural gas:** Methane that has been processed to remove impurities to a required standard for consumer use. It may contain small amounts of ethane, propane, carbon dioxide and inert gases such as nitrogen. In Australia, natural gas comes from conventional gas and coal seam gas.

**Levelised Cost of Energy:** the minimum cost of energy at which a generator must sell the produced electricity in order to achieve its desired economic return.

**Liquid fuels:** All liquid hydrocarbons, including crude oil, condensate, liquefied petroleum gas, other refined petroleum products, and liquid biofuels.

**Liquefied natural gas (LNG):** Natural gas that is cooled to around 160°C until it forms a liquid, to make it easier and cost effective to transport long distances in LNG tankers to markets.

**Non-renewable energy resources:** Resources, such as fossil fuels (crude oil, natural gas, coal) and uranium that are depleted by extraction.

**Petroleum products:** All hydrocarbons used directly as fuel. These include: liquefied petroleum gas; refined products used as fuels (aviation gasoline, automotive gasoline, power kerosene, aviation turbine fuel, lighting kerosene, heating oil, automotive diesel oil, industrial diesel fuel, fuel oil, refinery fuel and naphtha); and refined products used in non-fuel applications (solvents, lubricants, bitumen, waxes, petroleum coke for anode production and specialised feedstocks).

**Primary energy:** Energy found in nature that has not been subjected to any conversion or transformation process.

**Ramp gas:** The gas produced by coal seam gas wells as they are dewatered, prior to reaching full production.

**Regulated rate of return:** A system for setting the prices charged by government-regulated monopolies. The main premise is that monopolies will be compelled to charge the same price that would ideally prevail in a perfectly competitive market, which is equal to the efficient costs of production plus a market-determined rate of return on capital.

**Reliability:** The extent to which customers have a continuous supply of energy.

**Renewable energy resources:** Resources that can be replenished at a rate equal to or greater than the rate of depletion, such as biomass, hydro, solar, wind, ocean and geothermal energy.

**Total net energy consumption:** A measure of the total energy used within the economy. At an aggregate level, total net energy consumption is equivalent to total primary energy supply.

**Solar energy:** Generated when energy from the sun is converted into electricity or used to heat air, water and other fluids.

**Unconventional gas:** Generally refers to gas trapped deep underground by impermeable rocks such as coal, sandstone and shale. The most common types of unconventional gas are coal seam gas, shale gas and tight gas.

**Uranium:** A mildly radioactive element that, once mined, is processed into uranium oxide.

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