



Cleaner, Cheaper Australian Fuels

A 2030 VISION FOR
NATURAL GAS FUELS
– CNG AND LNG



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1. EXECUTIVE SUMMARY

Australia has a decision to make – do we take more control of our own future, by enabling the growth of a cheaper, cleaner, secure Australian energy source that supports jobs, boosts our economy and leads to a cleaner and healthier environment for our children?

OR

Do we bumble along with our current energy mix, watching our dependency on foreign fuel imports continue to escalate, our cost of transportation, electricity and goods rise, and Australian jobs sent overseas – with Australia losing power over its own destiny?

AUSTRALIA NEEDS A PLAN

Australia is an energy rich nation with an abundant supply of cleaner, cheaper natural gas.

We have 43 trillion cubic feet of natural gas reserves,¹ or 200 years supply, making it our home-grown advantage. We are also the third biggest exporter of liquefied natural gas;² but instead of using natural gas to power our transport and stationary energy systems, we put our natural gas on ships to send to other countries, while ships full of dirty foreign diesel arrive at our ports.

It doesn't make sense.

The United States, Norway, Argentina, and China are just some of the countries that have embraced natural gas fuels – and yet Australia continues to rely on dirtier, more expensive diesel imported from overseas as a fuel source.

Australia needs to step up and take control of our vision for 2030 and beyond. This is not a decision to be left to our children – we will have been left too far behind by then.

Australian natural gas fuels are not only cleaner, cheaper and healthier than diesel – they are the only feasible alternative for heavy transport.

We are almost unique worldwide as a vast continent with a strategic reliance on heavy transport for domestic and trade purpose and we have an abundant supply of natural gas. Our agricultural, mining and manufacturing sectors rely on cheap, efficient means of transport to send our goods around the country and to ports to be exported.

Australian natural gas fuels are not only cleaner, cheaper and healthier than diesel – they are the only feasible alternative for heavy transport. Natural gas vehicle technology is mature, proven in real world applications and is the only other technology that has a commercially available product for cars, heavy-duty trucks, buses, forklifts, trains, marine vessels and stationary energy.

Australian natural gas fuels are not only cleaner, cheaper and healthier than diesel – they are the only feasible alternative for heavy transport.

Not that diesel will be completely replaced for the foreseeable future, but we need a more sustainable, healthier, diverse fuel mix to protect our economy against world oil price and supply shocks.

Unfortunately, the market for natural gas as fuel for transport has stalled over the past few years with increasing taxation rates, deterring the growth of this promising but infant sector. As a country we want cleaner, cheaper Australian-produced energy sources – and yet we are only locking in diesel and making Australia increasingly reliant on imported fuels.

Australia was one of the pioneers in the use of natural gas fuels with Sydney and Adelaide both among the first in the world to introduce natural gas urban buses to their fleets.

However, any competitive advantage for Australian natural gas fuels has been eroded by changing policy settings and circumstances making it difficult for this infant industry to grow and compete. It is easy to put off the decisions for the future. But we know oil and diesel are only going to get more expensive, Australia will produce less oil and while we can import fuels, it will always be sourced largely from some of the most unstable regions in the world and require the cost of very long distance shipping.

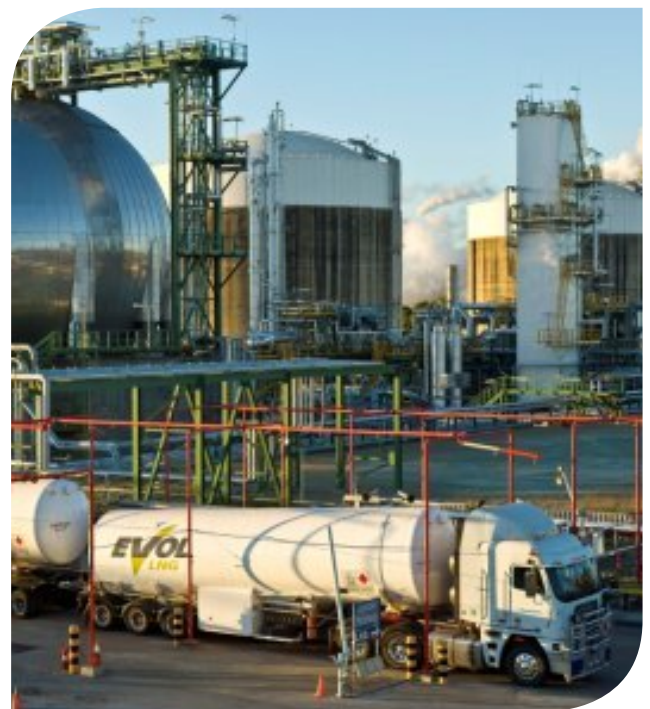
A recent NRMA report found that our dependency on foreign oil imports has grown from around 60% in 2000 to over 90% today.³ It warns that by 2030, Australia could have 100% dependency on foreign oil⁴ and as a result, Australia will face increased risks of disruption to our economy.

The Energy White Paper confirms that Australia's current oil stockholding do not meet our obligations under the International Energy Agency treaty. With the cost of meeting this obligation estimated to be an investment of several billion dollars; the adoption of natural gas fuels could increase Australia's self-sufficiency from an expected 30-40% by 2030 to 50-70% and save around \$10 billion in oil and petroleum product imports.⁵

Australia needs to do what other visionary countries – like Japan, Brazil and the United States have done. We need to develop a practical plan to secure our energy future and take the necessary steps to deliver a stable future for Australia.

There are multiple ironies at play for Australia:

- We are an energy-rich country with ambitions to be an energy superpower, but we are increasingly dependent on imported fuels for our domestic industry;
- We are admired throughout the world as a 'clean, green' country with beautiful air and water and yet we cling to dirty imported fuel sources; and
- We are a country at crossroads trying to shift away from unsuccessful industries towards niche industries that tap into Australia's competitive advantages – and yet we have failed to seize a clear opportunity to grow Australian jobs and grow our economy by leveraging our natural advantage in natural gas.



Source: EVOI LNG

Governments of both major political persuasions have recognised the natural advantage and common sense of using natural gas fuels:

- It was recognised in the Abbott Government's Resources and Energy Policy as an alternative to diesel for haulage vehicles, as a real opportunity to reduce greenhouse gas emissions and as a cheaper fuel source;
- It formed part of our transport fuels mix in the 2015 Energy White Paper;
- It can positively contribute to the reduction in pollution as well as provide an immediate opportunity to reduce carbon emissions from Direct Action – while creating Australian R & D and manufacturing jobs;
- It will reduce Australia's near total dependence on foreign imports of transport fuels – in a country that is heavily dependent on transport to move goods;
- It satisfies the key government drivers of helping reduce cost of living pressures, supporting our export industries like mining and agriculture and being a country that makes things, not just imports them – but in a way that supports a natural niche advantage; and
- Natural gas fuel was recognised in a recent Bureau of Resource and Energy Economics (BREE) report as having one of the lowest cost of production of any fuels in Australia out to 2050.⁶

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And best of all, unlike other 'visionary' energies, natural gas fuels are not pie in the sky. There are real trucks, real trains, real buses, real passenger cars and real ships using natural gas fuels now. But until we bite the bullet and ensure it is competitive, it will never get the critical mass necessary to compete against the 100 year entrenched, dirty, imported diesel.

This paper sets out a compelling vision and the opportunities available. We outline the compelling benefits of natural gas fuels and a 10 Point Action Plan. We urge all decision-makers to take the necessary steps to secure this natural advantage.

The journey should start now. If we are to be fair to future generations, it has to start now.



*We need to keep jobs and skills here in Australia.
Source: BOC.*

THE UGLY NUMBERS ON AUSTRALIA'S FUTURE FUEL IMPORT DEPENDENCY

- Average prices for 2012 for LNG exported from Australia amounted to **\$10.57/GJ** vs approximately **\$20.30/GJ** for crude oil imports and **\$26.80/GJ** for refined fuel imports. In other words, we are buying energy from overseas at more than twice the price we are selling it.
- Displacing **10%** of diesel used on heavy on-road transport could reduce imported diesel by **1018** million litres per annum and reduce CO₂ emissions by **597,000** tonnes.
- Oil is the largest primary energy source in Australia, accounting for **38%**.⁷
- According to a parliamentary committee report, Australia's dependency on foreign crude oil and refined petroleum products was projected to rise from **52%** in 2011 to around **80%** by 2020⁸. However, our dependency on foreign oil has already skyrocketed to **90%**, with projections it could rise to **100%** in coming years.⁹
- The transport sector consumes **37.9%** of our energy in Australia, more than mining and manufacturing combined.¹⁰
- Australia is also the only member of the International Energy Agency (IEA) that does not meet its commitment to stockpile the equivalent of **90** days net imports of oil¹¹. And that will only get harder and more expensive in the future without Australian fuels in the mix.
- Transport related green house gas emissions are predicted to grow by **37%** between 2005 and 2025. Transport is the third largest contributor to greenhouse gas emissions in Australia, accounting for **16%**¹² of Australia's carbon emissions.
- There are over **400,000** Australians and thousands of industry and business sites in regional Australia that are not on the electricity grid many of which are on expensive diesel generation. They deserve a cheaper, cleaner Australian source of fuel than diesel to service their energy needs.
- There are around **167,000** truck drivers in Australia—whose jobs depend on cost-effective transport and there are hundreds of thousands more people working in export-related industries that depend on our products being able to compete internationally.
- Australia has only **0.3%** of the world's oil reserves¹³ and in 2012-13 was importing **533,000** barrels of oil, even though we have almost a **200** year supply of natural gas.¹⁴
- In 2012-13 we imported **\$38.3** billion in crude and refined petroleum products, compared to exports in 2012-13 of **\$15.9** billion, a net import cost of **\$22.4** billion or more than **\$61** million per day.
- Every **10%** substitution of imported diesel by Australian gaseous fuels saves **\$870** million in import costs.

WHY NATURAL GAS FUELS – THE COMPELLING FACTS

Natural gas is cheaper and will lower the cost of living

It costs less at the bowser and is the only viable alternative to imported and expensive diesel for heavy freight.

Fleet-owners of LNG-powered trucks are saving tens of thousands a year. For example, an owner of five Kenworth trucks equipped with LNG compatible fuel systems saved \$88,000 in a year.¹⁵ The average 'food basket' for a person buying in Melbourne has travelled more than 21,000 kilometres by road and total transport across all forms, comprised 70,803 kilometres for the basket of food.¹⁶

Cost savings from using natural gas fuels to transport our food across the country flow through the economy and result in savings at the supermarket.

Natural gas is an Australian fuel that supports local jobs and a stronger Australian economy.

The skills, expertise, design and manufacturing that occurs and are developed along the natural gas supply chain is a niche that should be Australia's natural advantage and can be by adopting natural gas fuels for use in transport and electricity generation. As Prime Minister Tony Abbott has said, Australia still needs to be a place "where we make things".

Whether it's world-class catamaran and ferry building in Hobart, truck conversions in Perth, machining funnels for natural gas generators in Western Sydney or driving the burners at a food producer at Gympie, Australian natural gas drives Australian jobs and offshoot career opportunities.

Natural gas is cleaner and a direct action fuel

High emissions of particulate matter from diesel including carcinogen, is almost eliminated with natural gas use.¹⁷ Natural gas-powered heavy trucks emit up to 23% less greenhouse gas emissions than diesel-powered trucks.¹⁸ Converting one diesel truck for a natural gas-powered truck reduced emissions, in one study, by almost 35 tonnes of CO₂ per annum – equivalent to removing around 12 cars from the road.¹⁹



Source: BOC.

Australian natural gas fuels are Great Barrier Reef friendly

Australian natural gas is Great Barrier Reef friendly, because it dissipates on contact with water and we know that the Australian public strongly supports the adopting of cleaner energy sources and lower-emitting technologies²⁰ to protect our clean air and our natural environment.

Australian natural gas is a now fuel

Natural gas technology is well developed with countries all over the world already adopting natural gas fuels. In Australia, almost 4000 vehicles currently run on natural gas fuels.²¹ In North America and Europe many more trucks run on natural gas and numbers are growing. In Norway, the Government approved the construction and operation of natural gas passenger vessels, in Canada three new natural gas ferries have been contracted and in the USA, BC and Staten Island Ferries are studying options to retrofit their vessels from diesel to natural gas fuel.

Not only are natural gas fuels available now, but a recent report by the Bureau of Resource and Energy Economics noted that natural gas fuels are likely to have one of the lowest costs of production of any fuels in Australia to 2050.²²

Natural gas fuels are safer for our children

Australians in our cities and towns don't want their children breathing in toxic pollution. By shifting to natural gas fuels with fewer pollutants, Australia can make inroads into pollution and carbon reduction – without a tax. This means cleaner air and cleaner waters, preserving our beautiful environment, as Australian communities are increasingly demanding.

Natural gas fuels are cleaner and healthier

	DIESEL	NATURAL GAS
Carbon Dioxide (CO ₂)	✗	30% lower ↓
Nitrogen Dioxide (NO _x)	✗	75% lower ↓
Particulate Emissions	✗	90% lower ↓
Sulfur Oxide (SO _x)	✗	99% lower ↓

Source: Ferus, United States²³

10 POINT ACTION PLAN TOWARD A CLEANER, CHEAPER, AUSTRALIAN FUEL FUTURE

1 Support Direct Action to reduce greenhouse gas emissions through the natural low carbon advantage of natural gas fuels.

Recognise the 'direct action' carbon and pollution benefits that accrue by supporting natural gas fuels through the Emissions Reduction Fund (ERF) and other direct action measures.

Innovation in natural gas fuels means waste and other gases can be used as fuel for off-grid generation, trucks and other vehicles that would otherwise be using higher emitting diesel. Government should ensure that the ERF and other clean energy mechanisms facilitate this desirable outcome. For example, every truck that is converted from diesel to natural gas reduces emissions by almost 35 tonnes of CO₂ per year, equivalent to removing around 12 cars from the road.²⁴ It's silly that currently 'clean' energy funding will support a diesel hybrid generator but not a cleaner natural gas generator.

2 Support cleaner air and improved health outcomes through greater use of natural gas fuels.

Diesel exhaust, which the World Health Organisation concluded causes cancer in humans, is particularly dangerous because its sources are in urban areas where people live and work.

Australian Governments should implement measures, through the National Clear Air Agreement, to reduce Australians' exposure to diesel exhaust and encourage the use of low emission vehicles, vessels and equipment.

These could include setting emission standards, banning high emission vehicles, vessels and equipment from workplaces or urban areas; and introducing government procurement policies that require the purchase of low emission vehicles, vessels and equipment. It is perverse that island communities where solar is not an appropriate option get rebates for higher emitting diesel generation, while there is limited support for conversion to lower emitting gas generation.

3 Industry to build awareness of the benefits of Australian natural gas to potential purchasers and the Australian community.

Industry recognises that it must do more to make the community aware of the benefits and many application of natural gas fuels. Then we can shift the Australian community away from dependency on dirty foreign oil and towards cleaner, cheaper, Australian fuels.

Industry will promote the relative benefits and opportunities of natural gas fuels within Australia's suite of cleaner alternatives. While Australia will seek a range of lower emitting technologies for different uses – solar power can't drive a truck from Perth to Gladstone. Government policies should be technology neutral and allow consumers to purchase the right 'cleaner' technology for their circumstances and not just support 'policy preferred' renewable sources that can't do every job.

4 Introduce appropriate tax settings during the development cycle of this infant industry.

The tax system can be used to help reduce the inevitable upfront costs of first movers in the infant natural gas transport sector so it can achieve economies of scale and overcome the entrenched policy advantages enjoyed by existing fuels.

For example, it should:

- Provide appropriate tax breaks such as accelerated depreciation for the higher upfront costs of new or converted trucks using cleaner, cheaper, natural gas fuels. This would reduce the average age of heavy duty vehicles in Australia from 13.7 years, compared to 7.8 in the UK, and 6.7 in the USA.²⁵
- Reduce excise in line with the commitment by the Government, reinforced in the Energy White Paper, that tax on natural gas fuels would not be more than 50% of the rate on diesel/petrol on an energy equivalent basis, given it is now heading to over 70%.
- Ensure 'green schemes' support reduced emissions, including particulates, not just 'chosen' technologies. For example, ARENA will support a higher emitting diesel hybrid but not a lower emitting natural gas generator.

5**Use natural gas to power regional and remote Australian communities.**

Regional and rural communities and business that aren't on the electricity grid or near a gas pipeline should have access to cleaner, cheaper and secure natural gas fuels. This includes remote agricultural and mining areas as well as indigenous communities reliant on unregulated diesel generation – often cross subsidised by taxpayers.

Governments should recognise that 'virtual' natural gas pipelines using new technology can transport liquefied and compressed natural gas to off grid regional and remote communities more cost effectively than expensive and often subsidised pipelines.

6**State and local government should make a strong commitment to adopt natural gas for major bus, ferry and train services.**

For cleaner air and water and lower costs, state and local governments should facilitate the adoption of cleaner, cheaper natural gas fuels. We already have over 4,000 natural gas powered buses in Australia, but that is only the beginning.²⁶ We still have over 90,000²⁷ buses on the road that are polluting our streets from dirtier, fuels.

7**Support innovation and R&D in Australian natural gas fuels.**

Federal Government grants and schemes should support new industries, like natural gas fuels that are creating jobs and finding innovative ways to provide a cleaner environment for the Australian community. For example, grant schemes and the ERF should seek to capture, support and grow our natural advantage and downstream skills in natural gas fuels as part of a broader strategy to reduce emissions and particulates – especially where renewables don't offer a realistic solution. We should be supporting innovation, R&D, and manufacturing jobs in the development of gas engine technologies – including the Australian niches of large 15 litre engines and mining vehicles. We should do this before we lose our automotive manufacturing sector's skills and knowledge.

8**Reform government policies and regulations that impose costs on consumers and taxpayers and discourage the use of natural gas fuels.**

Government should reform energy policies and programs that discriminate against natural gas. This includes cutting bureaucratic red tape that imposes millions of dollars in administrative costs which are passed on to consumers. An example includes climate change policies and programs that are restricted to renewable energy and exclude cleaner, cheaper natural gas. Other issues include the higher regulatory costs for the transport of natural gas fuels across State and Territory borders due to different state regulations, along with government charges and penalties on importing vehicle variants.

9**Facilitate natural gas refueling infrastructure.**

Like in the US, the Australian Government and industry should work collaboratively to facilitate the gradual expansion of refueling networks on major highways. The Government needs to fulfill its election commitment to support the development of logistics systems for natural gas as a transport fuel in transport corridors such as Brisbane, Sydney and Melbourne. The industry will work with the Government to take the first practical steps.

10**Government, industry and training sectors work together to develop a Workforce Skills Development Strategy.**

Australia natural gas is our natural advantage and we need to retain and further develop the skills associated with the natural gas industry and offshoot sectors and in turn become international leaders. We need to identify the immediate, mid-term and long-term career streams and specialisations that our workforce should develop to be internationally competitive.

WHAT ARE NATURAL GAS FUELS?

Natural gas fuels are clean, cheap and produced locally from Australian natural gas which is abundantly available in Australia and is found underground in many different types of rock formations and other biological sources. Natural gas is colourless, odourless, non-corrosive and is one of the safest fuels available.

The natural gas we use at home to heat water or cook meals can be liquefied to form Liquefied Natural Gas (LNG) or compressed to form Compressed Natural Gas (CNG).

Depending on the application, natural gas fuels come in a number of different forms including, liquefied, compressed and high density, all with their own benefits and characteristics.

Compressed Natural Gas (CNG) is made by sending the natural gas through a gas dryer and compressor, where it is compressed to less than 1% of the volume it occupies at standard atmospheric pressure.

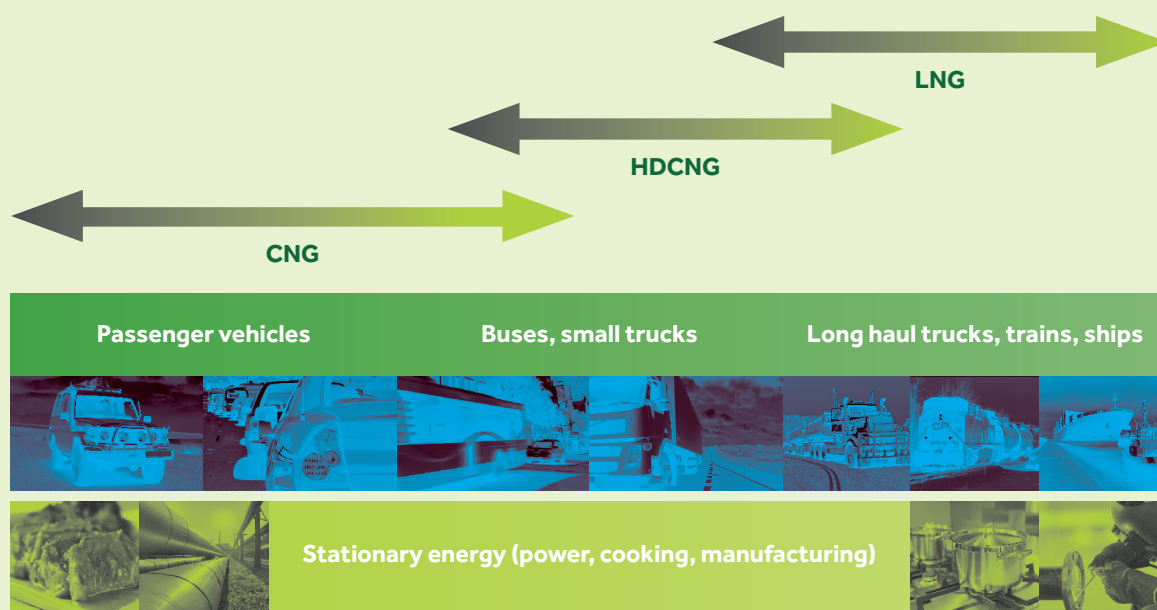
High Density Compressed Natural Gas (HDCNG) is a new technology for storing natural gas which means vehicles can drive longer and need to refuel less often than current CNG.

Liquefied Natural Gas (LNG) is created by cooling natural gas and reducing its volume by more than 600 times, making it easier to transport.

These processes increase the energy density of natural gas which makes it manageable to store the gas in tanks which can be used to fuel vehicles or transport gas without the need for pipelines. But no matter what form it is stored, it is still natural gas.

Natural gas can be used as a transport fuel for cars, vans, light-duty and heavy-duty trucks, buses, forklifts, trains, mine vehicles and marine vessels. It can also be used for what is called stationary energy such as electricity generation, cooking, resource processing and manufacturing.

Common Applications of Natural Gas Fuels



2. THE 2030 VISION

We want a better, cleaner Australia with a stronger economy where:

- Ferries and ships coasting over the Great Barrier Reef, through Sydney Harbour and across Bass Strait are powered by cleaner, safer natural gas, avoiding disastrous oil spills and reducing pollution.
- People sitting at cafes or walking along busy roads or sitting on the back of a Brisbane river ferry aren't greeted with unpleasant, polluting, toxic diesel fumes.
- Australia uses its natural advantage – our abundant natural gas supplies – rather than taking gas produced here and sending it to Asia, while at the same time, cargos of foreign diesel come in to meet our transport needs.
- Our transportation costs are lower, leading to cheaper goods for Australians, more competitive exports and a stronger long-term economy.
- Australians are employed to produce and distribute Australian gas for Australia's needs – for our rail, heavy trucks, ferries, ships, mining equipment and power generation.
- Australia is at the forefront of innovation and R&D in gas fuels, heavy-duty vehicles, ships and trains – leveraging our natural advantage to develop expertise that can be commercialised and exported to the world.
- Australia can better meet its 90-day stockpile needs for oil, because we aren't relying heavily on imported oil or diesel for all of our transportation needs.
- People who live and drive in the vicinity of tunnels and inner city corridors aren't subjected to toxic diesel vehicle fumes, don't have health problems²⁸; and natural gas trucks are incentivised to use tunnels.

Australian natural gas is a Great Barrier Reef friendly fuel.

We should aim to have fewer ships and ferries using diesel and marine oil and more using safer, cheaper, evaporating natural gas fuel to reduce the risk of damaging spills – and its good for direct action on climate change as well.



To realise this vision of a cleaner, greener, richer Australia, we should aim to see the following achieved by 2030:

- At least 25% of on-road heavy duty trucks powered by cleaner, cheaper Australian natural gas;
- At least 50% off-road heavy duty trucks and plant purchased from 2030 onwards – particularly in our cost-exposed export industries – be Australian natural gas powered;
- A national network of natural gas refueling stations to be established along designated national highways and other strategic long haul routes, to encourage the use of this cheaper, cleaner fuel;
- Australian cities using natural gas for major ferry services, for cleaner waters, a better environment and cheaper services;
- Australian trains being run by cheaper, cleaner natural gas along 50% of routes;
- Tasmania's National Sea Highway and other coastal shipping using shipping and ferries powered by natural gas, to reduce cost pressures on our shipping industry;
- Use of stationary natural gas to power remote Australian communities that are not on the electricity grid or gas pipeline, to secure their energy security;
- Australia being a world-leader in developing and exporting natural gas related equipment and technology – driven by research, development and manufacturing based on Australia's natural gas fuel advantage and expertise in handling the fuel;
- A strong domestic manufacturing industry for natural gas aftermarket engine modification and potentially Original Equipment Manufacturing (OEM) especially for the larger 15-litre road train trucks, which are specifically and uniquely needed in Australia and not likely to be developed elsewhere; and
- Incentives provided for logistics and freight companies to use natural gas vehicles when transporting goods through inner city corridors and tunnels.

*Real trucks running on Australian natural gas.
Source: BOC.*



WHAT OTHERS HAVE SAID ABOUT AUSTRALIAN NATURAL GAS:

Andrew McKellar, Chief Executive, Australian Automobile Association "The AAA suggests that further consideration and evaluation of the treatment of gaseous fuels must be considered in order to facilitate a greater uptake of these fuel types to reduce reliance on petrol and diesel and promote more environmentally sustainable motoring".

General Manager, Nestle Gympie "We've chosen to move to LNG because it is a clean source of gas; it is locally supplied and very cost competitive. It is a source of pride that this is Queensland gas."

Michael Roche, Chief Executive of the Queensland Resources Council "Liquefied natural gas (LNG) and compressed natural gas (CNG) all have the potential to make significant employment and tax contributions as well as diversifying Australia's fuel supply mix. Each of these technologies has different potential to contribute in terms of volume and timing".

Dr Brent Jackson, Executive General Manager, Engineers Australia "Australia has a natural gas advantage that should translate into a world leading natural gas industry and competitive advantage driving economic growth and local engineering, design and other jobs. Engineers Australia supports the need for a diverse domestic fuel market in Australia ensuring we are not 100% dependent on foreign fuel imports."

Robert Clifford AM, Chairman, InCat Group of Companies "Australian natural gas is a high quality, environmentally friendly fuel, which is cheaper than distillates and supports Australian jobs. In Tasmania, we were proud to be a first mover, designing the world's first high speed LNG ferry. The experience of sourcing and using domestic gas on this world's first vessel proved to be very satisfactory, as the quality experienced is far greater than is available to our customers in other global markets."

Scott McDine, AWU National Secretary "We currently have a situation in which our abundant gas reserves are hurting Australian jobs and households instead of helping them. That's crazy and it's no wonder no other gas-exporting nation allows it. We are throwing away hundreds of thousands of jobs, and our national competitive advantage, simply so gas exporters can squeeze a little extra profit out of what is already a spectacularly profitable business."

Graham Blight, NRMA Director "We do not want to scare people with our report, but facts are facts. Australia's dependency on imported fuel and oil for transport has grown by more than 30 percent from 60 percent in 2000 to 91 percent in 2013 and we are approaching 100 dependency on imported transport fuels."

Project Manager, Murphy Pipe and Civil, Brisbane "It will be used in industries such as transport as a replacement for diesel, which also has the benefits for the environment and reduces the carbon footprint that we create."

Project Manager, ICD Asia Pacific "This investment is critical to Queensland, critical to local community and good representation of the opportunities that exist in Queensland. A lot of people have had the opportunity to work on these projects and these skills are now within the state and ready to be deployed on the next project."

Andrew McKellar, Chief Executive, Australian Automobile Association "Australia should explore and trial the use of CNG passenger cars and LNG in heavy vehicles to increase our utilisation of domestic energy sources".

Professor Robert Clark, University of New South Wales "Australia's fuel self-sufficiency could be increased to 50 to 70% by 2030 through using natural gas as a transport fuel, compared to just 30 to 40% using current fuel sources."

Strategic Framework for Alternative Transport Fuels, Department of Industry. "Gaseous fuels can potentially deliver greenhouse gas emission reductions and air quality benefits compared to conventional petrol and diesel products, with reported greenhouse gas reduction potentials including up to 13% reduction for LPG, up to 17% reduction for CNG and up to 20% reduction for LNG. In terms of air quality benefits of gaseous fuels, the following has been claimed heavy vehicles using CNG or LNG generally produce significantly lower particulate matter, sulphur and non-methane hydrocarbons also known as air toxics."

POLICY DRIVERS FOR GOVERNMENT

Natural gas fuel for transport is an emerging market in Australia and it is trying to compete with diesel, which has an effective monopoly on heavy transport vehicles. Natural gas is the only viable competitor to diesel in the long-term but it is currently trapped in the early emergent phase of growth. The suitability of cleaner, cheaper natural gas for heavy-duty applications allows it to displace more oil on a per vehicle basis than other fuels and technologies currently available.

No other fuel has the capacity or the capability to displace oil on a scale that matches natural gas.

Market forces alone won't facilitate a transition to transport natural gas fuel sustainably, despite it being cheaper at the bowser and cleaner. There are too many artificial barriers in place that have distorted the market. Tax settings, inconsistent state regulations, lack of refueling infrastructure and the upfront costs of conversion have inhibited the growth of the industry.

Around the world, uptake of natural gas has improved when backed by a deliberate government strategy to recognise the long term structurally advantageous position and entrenchment of diesel and to back natural gas fuel sources in the interests of the economy, the environment, and diversifying fuel source.

A stronger commitment to transport fuel diversity from Government could include a strategic approach to displacing imported fuel and ensuring that 'critical' vehicles are among those that include natural gas in their fuel mix.

These include garbage fleets, public buses, emergency vehicles and the long haul and inner city trucks that transport and distribute our produce all over Australia.

Even in the United States, the land of free-market economics, where there is a far larger market and it is therefore more cost-effective to develop networks at scale, natural gas fuels have benefited significantly from government support – to reduce the USA's exposure to foreign oil dependence and to get direct action environmental outcomes.

For example, Washington State Ferries (WSF) recently announced it is trialing conversion to LNG to keep the air and water cleaner and to secure their 'energy independence'.²⁹ WSF cited fuel as being its fastest growing operating expense and a cheaper fuel was needed. They also talked about the environmental benefits, including:

- 89% reduction in particulate matter
- 61% reduction in nitrous oxide
- 28% reduction in carbon dioxide
- 59% reduction in sulphur dioxide

No other fuel has the capacity or the capability to displace oil on a scale that matches natural gas.

According to WSF, there are several other examples of government decisions to adopt natural gas fuels around the world, including:

- The Norwegian Government in 2000 approved the construction and operation of natural gas passenger vessels. There are currently 20 car and passenger ferries operating in Norway that are fueled by natural gas.
- In North America, BC Ferries and Staten Island Ferries, are studying options to retrofit their vessels from diesel to natural gas fuel.
- The Quebec Ferries Company has contracted for three new natural gas ferries.
- There are also natural gas fuel passenger vessels currently under construction or in design for service in Argentina, Uruguay, Finland, and Sweden.³⁰

Despite the natural advantage and the niche opportunity for Australia to reduce its exposure to future shocks and rising fuel prices, the economics on their own aren't there yet for Australian consumers. And we risk losing our natural advantage by failing to act in the short term for long term gain. If Australia wants a cleaner, cheaper, locally produced source of fuel to power its increasingly emitting, increasingly growing heavy transport sector, Australian Governments – Federal and State – need to take leadership.

We agree with the comment of one Coalition Senator who, in responding to our consultation document, indicated that if the Federal Government is to spend \$3.25 billion on direct action, he would rather it was for practical outcomes such as greater use of natural gas fuels.

If Australian taxpayers are going to provide subsidies and policy support for fuel, isn't it better to support viable, cleaner Australian sources of fuel, not foreign imports?

The Australian policy drivers for cleaner, cheaper Australian heavy transport fuel sources



3. ADDRESSING DOMESTIC ENERGY CHALLENGES FOR AUSTRALIA

EMERGING ENERGY ISSUES FOR AUSTRALIA

INCREASING RELIANCE ON FOREIGN OIL

Australia imports around 80-90% of our crude oil and refined petroleum products.³¹

The total annual cost of crude and refined petroleum imports (including LPG) in 2012-13 was \$AU38.3 billion.³² Exports over the same period of \$AU15.9 billion give Australia a net import cost of crude based fuels of \$AU22.4 billion. This equates to more than \$AU61 million per day. Our demand for oil based transport fuels requires us to spend \$22.4 billion on imports each year.

Average prices for 2012 for LNG exported from Australia amount to \$10.57/GJ vs. approximately \$20.39/GJ for crude oil imports and \$26.80/GJ for refined fuel (diesel and petrol) imports. In other words, we are buying energy from overseas at more than twice the price that we are selling it. This can be reduced by displacing imports of refined fuels with locally sourced natural gas.

Our demand for oil based transport fuels requires us to spend \$22.4 billion on imports each year.

It was not all that long ago – in 2002-03 – that Australia enjoyed a trade surplus in oil and liquid fuels. However, the closure of Australian refineries due to their relative lack of competitiveness with their Asian counterparts and our finite oil resources has resulted in the importation of refined petroleum products tripling over the last ten years.

By 2011, Australia had shifted from a net exporter of oil fuels to having an estimated trade deficit of \$18 billion crude oil and refined petroleum products.

We are buying energy from overseas at more than twice the price that we are selling it.

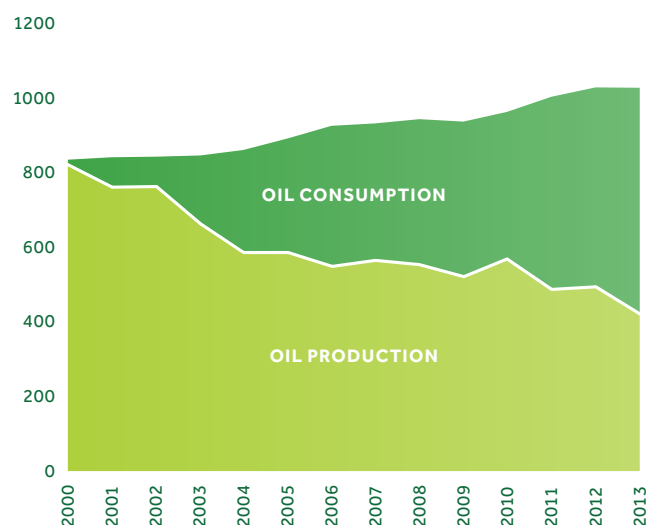
Given recent trends, Australia's self-sufficiency in crude oil and refined petroleum products is likely to continue to drop – from around 48% in 2011 to around 20% by 2020.³³

This is not just because of the decline of Australia's refinery industry but also because our demand for energy will – on all projections – dramatically increase over the next twenty years because of our growing economy and growing population. ACIL Tasman, for example, has projected that Australia's energy demand will increase by 50% between 2000 and 2030.³⁴

The projected cost of oil imports is expected to climb from \$20 billion to \$100 billion per year by 2030, leading to a significant trade imbalance.

Australia's oil production and consumption

(2000-2013; in thousands of barrels per day). Source: BP 2014



Australian Natural Gas Fuels in Australia – Current Activity and Future Opportunities

Northern Territory

- Abundant resource
- Cheaper, cleaner remote/resources sector power generation
- Relies on road trains and long haul trucking

Queensland

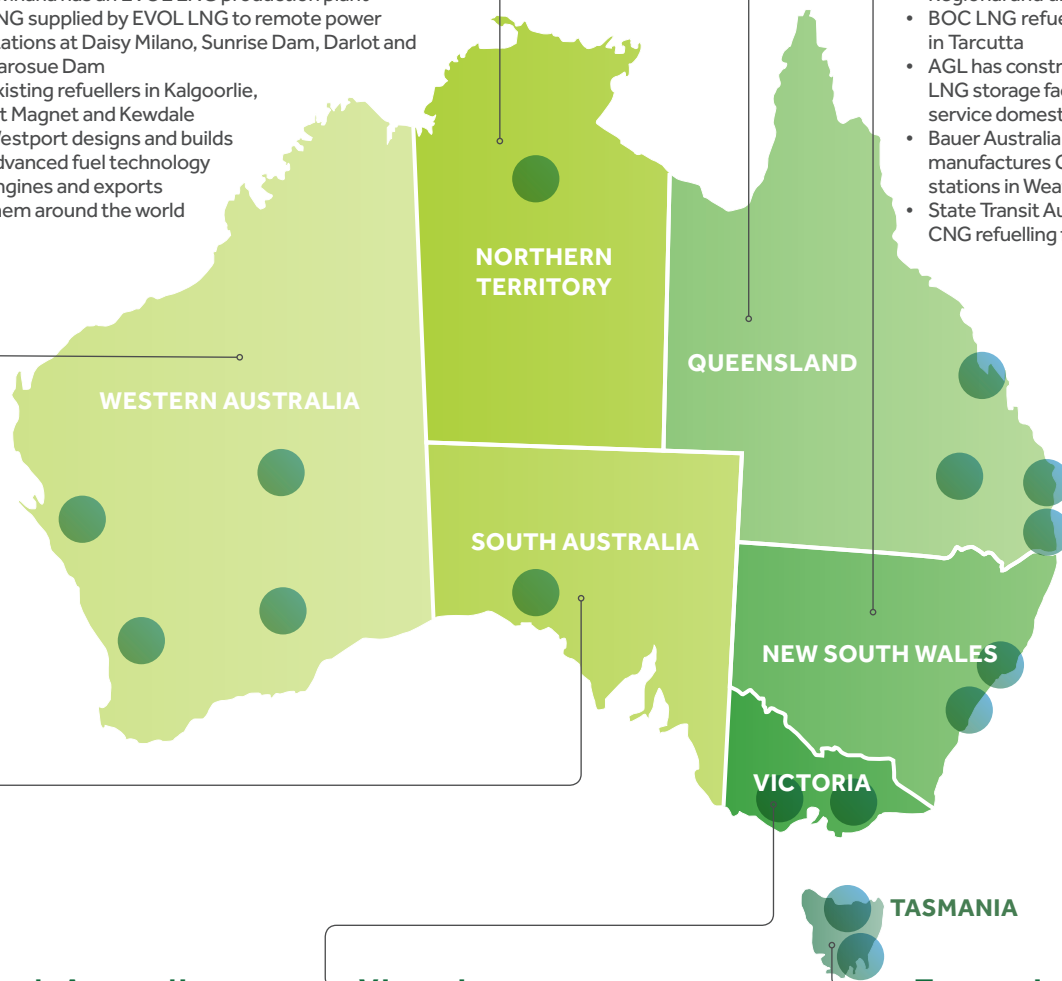
- Natural gas sourced in Queensland
- BOC's Micro LNG at Chinchilla, constructed using Australian based designers and constructors and supplies to domestic users in Gympie and the Sunshine Coast among others
- 'Clean' tourism fuels for the Great Barrier Reef
- Niche manufacturing, marine and engineering opportunities
- Cheaper, cleaner remote/resources sector power generation
- Replacing fuel for food production and manufacturing
- Regional state, relies on rail and long haul trucking
- IntelliGas in Queensland powers HDCNG trucks to transport produce
- Brisbane City Council bus depot CNG refuelling facilities

Western Australia

- Abundant natural resource and use
- Cleaner, cheaper remote power for resources sector power generation
- Current LNG production and refuelling first mover
- Major exporter exposed to transport costs
- Kwinana has an EVOL LNG production plant
- LNG supplied by EVOL LNG to remote power stations at Daisy Milano, Sunrise Dam, Darlot and Carosue Dam
- Existing refuellers in Kalgoorlie, Mt Magnet and Kewdale
- Westport designs and builds advanced fuel technology engines and exports them around the world

New South Wales

- Increased urban exposure to pollution
- Long haul trucking, national highway routes
- Public transport/cleaner ferry fuel
- Niche manufacturing opportunities
- Regional and urban rail network
- BOC LNG refuelling station in Tarcutta
- AGL has constructed a \$300 million LNG storage facility in Tomago to service domestic demand
- Bauer Australia designs and manufactures CNG vehicle refuelling stations in Weatherill Park
- State Transit Authority Bus Depot CNG refuelling facilities



South Australia

- Abundant natural resource
- Developing gas files
- Post car industry niche manufacturing
- Defence industry aspirations
- Adelaide Metro Bus Deposit CNG refuelling facilities

Victoria

- LNG cryogenic vessel and road tankers provided by CEM in Coolaroo
- Victorian based company GLP designed Westbury and Chinchilla Micro LNG plant
- BOC opened a \$65 million LNG plant in Dandenong in 2012
- Existing EVOL LNG refuellers in Deer Park, Wodonga and Leongatha
- Refuelling stations have been designed and built in Victoria and exported around the world
- Defence industry, shipping industry
- Refuelling first mover and current production
- Long haul trucking, national highway routes
- Increased exposure to urban pollution
- Several public CNG refueling stations in Melbourne

Tasmania

- INCAT, a Tasmanian-based ferry manufacturing company designs and build LNG-powered ferries
- BOC Micro LNG plant in Westbury operating since 2011 supplying a dairy product processor, a pulp mill and an asphalt plant
- LNG Refuellers has five sites across Tasmania
- Launceston training facilities for LNG users
- First mover and clean aspiration
- National sea highway exposure to fuel costs
- Niche marine manufacturing
- SeaRoad in Devenport has ordered an LNG fuelled ship to carry freight on Bass Strait

INCREASING EXPOSURE OF AUSTRALIAN INDUSTRIES TO RISING OIL PRICES

The core pillars of Australia's economy – primary industries, resources and manufacturing – rely heavily on foreign oil in the form of diesel and are therefore hugely affected by increased prices or interruptions.

Importantly in our vast, regionalised nation, Australia is heavily reliant on the efficient transportation of goods for our economic prosperity. We are a vast continent and are also a trading nation. More than 99% of our goods are transported by truck or by ship – all largely dependent on foreign produced diesel supplies, which is also shipped over large distances.

In Australia 97% of transport is fuelled by oil, making it severely exposed to oil price fluctuations.³⁵

While our local production of fuel is declining, demand for transport fuels overall is expected to increase by as much as 35% by 2030.³⁶

Based on estimated fuel pricing as at July 2014 and fuel use in 2013, displacing 10% of diesel used annually in Australia could potentially:

- Reduce imports of imported diesel by 1,018.3 million litres per annum
- Reduce import costs by \$869.6 million per annum or \$2.4 million per day
- Reduce transport operators' fuel costs by \$319.2 million per annum or \$875,000 per day
- Reduce CO₂ emissions by 597,000 tonnes or 17.9% compared with diesel

This rising oil price will flow on to affect the price of our goods here in Australia, the competitiveness of Australian goods on international markets, but also the dividends the Australian community receives in terms of employment benefits.

There are also an estimated 167,000 truck drivers in Australia³⁷ and their jobs depend on the cost-effectiveness of transporting goods across Australia.

There is a strong economic imperative to address our growing reliance on foreign oil given the growing uncertainty around future diesel prices and whether prices will be affordable to meet Australia's energy needs.



*Using Australian natural gas fuels for domestic use will limit our exposure to interruptions and price increases.
Source: BOC.*

AUSTRALIA'S DEGRADING FUEL SECURITY

Our growing dependence on imported oil also leaves Australia more vulnerable to potential disruptions to overseas crude oil and petroleum products supply chains.

A number of reports have reinforced the need for Australia to ensure diverse sources of supply to avoid future fuel security challenges and potential supply disruptions.

In December 2014, Engineers Australia released 'Energy Security for Australia'. The report notes that now is the time to open the discussion on fuel security to the community and that energy security comes from having a reliable flow of energy.³⁸

The Australian Government conducts regular National Energy Security Assessments (NESA). The past two assessments in 2009 and 2011 have found that Australia's fuel security will move from 'high' to 'moderate' from 2016.³⁹

'Moderate' fuel security means there are a number of 'emerging issues that will need to be addressed' to ensure Australia's needs are being met.

Australia's overall oil self-sufficiency is projected to decline from over 50% in 2007 to 19% by 2030⁴⁰. If no alternative fuels are developed, Australia's fuel in the transport sector self-sufficiency will decline from 64% today to 35% by 2030.⁴¹

This means that if we do nothing to encourage the development of alternative fuels for transport, we will have dramatically less security when it comes to fuel because we will rely increasingly on foreign, expensive diesel.

Studies have shown that, if consumers shift their focus to Australian-sourced fuels, this uptake will begin to reverse the decline in Australia's transport fuel self-sufficiency from around 2020. Self-sufficiency would then quickly recover to between 55% and 79% by 2030, depending on the rate of uptake.⁴²

Energy security may become a priority due to possible breakdowns in the competitiveness and efficiency of global oil markets due to the concentration of oil resources in fewer regions, and possible disruptions caused by war or catastrophic climate events.

If we do nothing to encourage the development of alternative fuels for transport, we will have dramatically less security.

Even now, Australia does not hold the necessary reserves of crude oil to properly safeguard our economy against the consequences of any crisis or disruption to supply. Australia is also the only member of the International Energy Agency (IEA) that does not meet its commitment to stockpile the equivalent of 90 days net imports of oil.

There is therefore a strong incentive for Australia to address its growing reliance on foreign oil and to diversify its risk by developing locally produced alternative fuels.

REAL LIFE INNOVATION AND EMISSION REDUCTIONS

One of the United States biggest landfills located in California is capturing its waste gas and turning it into natural gas fuel. BOC's parent company, Linde Group, worked to design and build a plant which would create natural gas fuel, which in turn will fuel the local garbage trucks. It is the world's largest landfill gas to LNG plant and it reduces California's greenhouse gas emissions by up to 30,000 tonnes annually.

The Federal Government's Emission Reduction Fund should be supporting practical outcomes like turning waste gas into natural gas fuels.

Source: BOC Website

CASE STUDY 1

AN EXPRESS COMMITMENT TO FUEL DIVERSITY

Australia's continued dependence on crude oil, especially imported fuels, is not sustainable. A commitment to fuel diversity requires a paradigm shift from an 'alternative fuel' mindset, where alternatives are available on a small scale and in niche applications, to a 'fuel choice' mindset, which makes a range of fuels readily available to all users.

Natural gas can already fuel trucks, cars, trains, buses and ferries. In order to maximise the impact of more diversified fuel sources, we should target the use of natural gas fuels in transportation methods that are

most dependent on crude oil, giving us the maximum reduction in greenhouse gases and quickly reducing our reliance on dirty foreign fuels.

NEED FOR CLEANER AND MORE EFFICIENT ENERGY SOURCES

Here are the facts about natural gas fuels that need to be considered as Australia transitions to a cleaner, greener economy:

- The transport sector contributes around 16% of Australia's net greenhouse gas emissions and is the third largest contributor to Australia's greenhouse gas emissions, after stationary energy and agriculture.⁴³
- Transport-related greenhouse gas emissions are also predicted to grow by 37% between 2005 and 2025⁴⁴. Indeed, emissions from road transport already grew by almost 17% in the ten years from 1997-08 to 2007-08.⁴⁵
- The projected growth in emissions from commercial vehicles (27%) is forecast to grow three times faster than that from passenger cars.⁴⁶
- Australia's overall economy-wide emissions are projected to rise to 24% of 2000 levels, indicating that Australia is likely to struggle to meet its mid-term emissions reduction target of 5%.
- Independent research has demonstrated that using natural gas for heavy trucking can reduce greenhouse gas emissions by up to 25%.⁴⁷
- With IPCC targets of a 40-70% reduction in carbon emissions by mid-century, natural gas vehicles offer an opportunity for immediate contributions towards this target.
- Using natural gas fuels in trucks can increase the life of a vehicle, requires less servicing and is quieter than dirty diesel engines and reduced engine knock.
- Independent research has also shown that a switch from diesel to LNG reduces greenhouse gas emissions from well to wheel by 28% and from diesel to CNG by 29%.⁴⁸
- Currently, Australia's long-haul fleets and heavy trucks (for example, used in the mining industry) rely on diesel, which not only emits more greenhouse gases than natural gas, but is also carcinogenic according to the World Health Organization.⁴⁹
- The use of CNG and LNG, when compared to diesel, reduces life cycle particulate matter from 85% to near 100% (i.e. undetectable levels), emissions of nitrogen oxides by 17 to 80% and emissions of GHGs by at least 16 to 23%.⁵⁰



Source: Evol LNG

The use of CNG and LNG, when compared to diesel reduces life cycle particulate matter from 85% to near 100%.

4. OUR NATURAL ADVANTAGE – NATURAL GAS

Making the decision to shift to Australian natural gas for Australian trains, trucks, ships and power remote regional areas is strategically important to Australia's economic and environmental future.

Other countries with foresight and commitment have pushed ahead with critical fuel restructures to meet their national interest.

- Winston Churchill shifted England's navy from coal to oil;
- Brazil focused on biofuels to meet its fuel shortage;
- The United States has deliberately cultivated its shale gas revolution;
- Japan and France turned to non-traditional energy sources to address their national needs;

There are currently more than 16.7 million natural gas vehicles on the road around the world operating in more than 85 countries.

Even though we are a vast continent that primarily relies on trucking and roads for transport, Australia is ranked 45th in the world and 17th among OECD nations in terms of numbers of natural gas vehicles on the road.

AUSTRALIA'S PLENTIFUL NATURAL GAS SUPPLIES

While Australia has limited and dwindling supplies of conventional oil, we have large reserves of natural gas.

Natural gas is in fact our natural advantage.

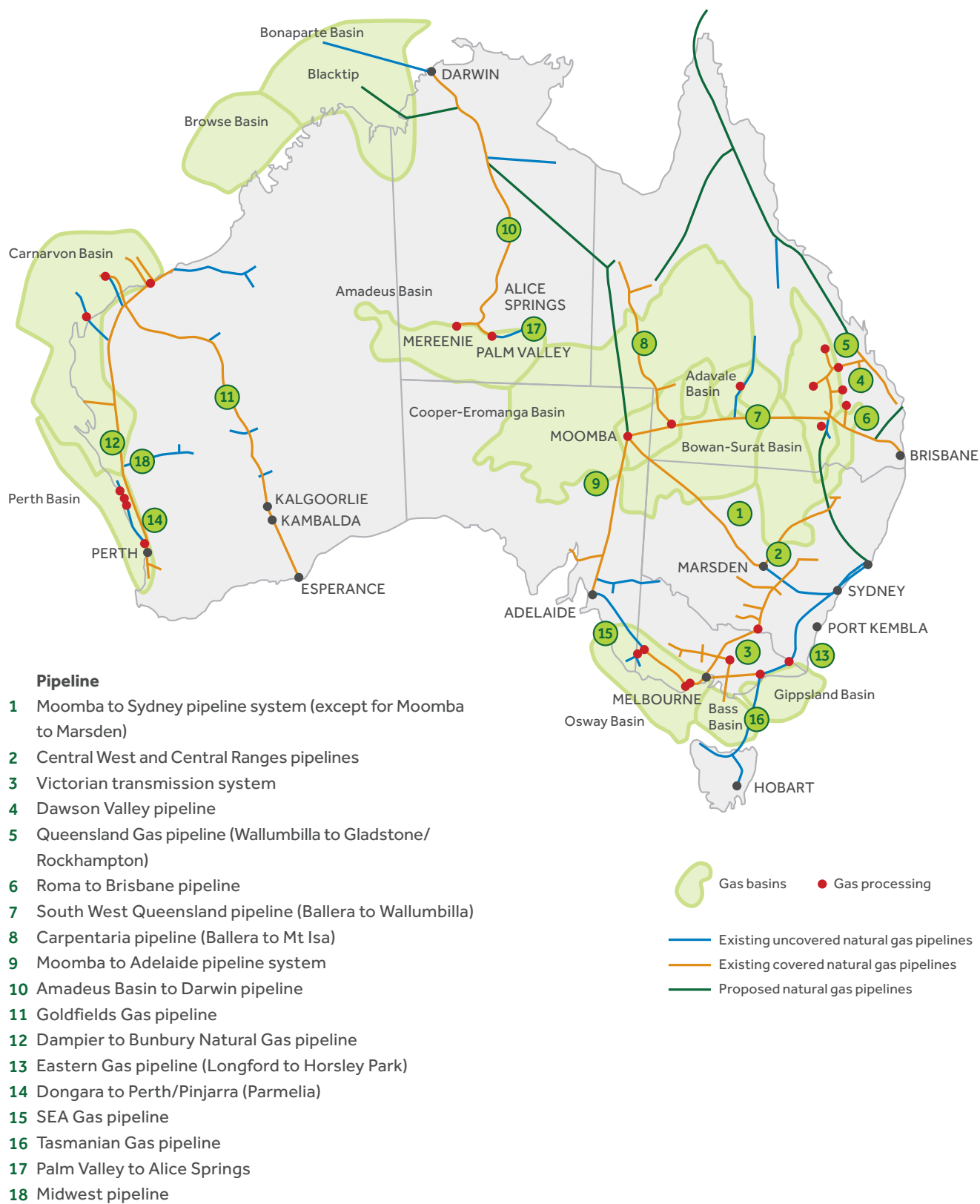
Australia is currently the third largest natural gas producer in the world, behind Qatar and Malaysia⁵¹ and potentially the world's largest exporter. We have 43 trillion cubic feet of natural gas reserves,⁵² or 200 years of known reserves, so natural gas is Australia's natural advantage.

The Government should work with industry to secure supply of natural gas for domestic purposes to ensure our country has long term access to cheaper natural gas fuels to give certainty to consumers.



*Australia has almost 200 years of natural gas reserves.
Source: EVOL LNG.*

Major gas transmission pipelines and proposed pipelines in Australia



Source: Natural gas reserves, Australian Parliament House Library, 2007

AUSTRALIAN NATURAL GAS FOR AUSTRALIA'S HEAVY TRUCKING

Australia is a trading nation that is also a vast continent and as a result we have a particular need for heavier, larger long-haul trucks. And we have a disproportionately high rate of heavy vehicles overall – we have 20% of the world's long-haul trucks.

Transport currently accounts for 38.2% of Australia's overall energy demand⁵³ and our freight task is set to double by 2030.⁵⁴

As global oil prices continue to rise, it is therefore timely to examine why Australian business, jobs and consumers need to continue to rely on foreign fuel when Australia has an abundant supply of alternative fuels, including natural gas.

Few Australians know that natural gas is the only viable alternative to diesel for long-haul trucking. And our trucking industry is an important part of the Australian economy – in 2011, it was worth \$35.6 billion to our economy and paid \$6.5 billion in wages to Australians.

Natural gas transport fuel is not a futuristic 'pie in the sky' technology. It is technology that is already being used around the world every day. While transport natural gas is an industry in its infancy in Australia, it has already taken off in the United States.

We therefore have not only the gas source available, but also the ready-market for heavy transport.

Australia has previously been a world leader in using natural gas as a transport fuel, we have not adequately exploited the opportunity to manufacture natural gas compatible transport vehicles. Nor are we doing enough to develop any other specialty, niche Australian job opportunities associated with this naturally Australian fuel, such as rail and heavy mining engineering opportunities, ferry and ship building, and innovation in after-market truck engine conversion.

Currently, in Australia, suppliers of medium-duty and heavy-duty trucks and engines in Australia include Dennis Eagle, Isuzu, Iveco, Volvo, Mercedes Benz and Cummins. Iveco and Mercedes Benz both also supply light-duty vans and trucks. Dual-fuel conversions are also possible for heavy-duty vehicles using systems supplied by Clean Air Power.

LNG transport fuel is not a futuristic 'pie in the sky' technology.

Australia is a vast continent and we have 20% of the world's long haul trucks. The strength of our economy depends on the cost effective transport of goods to market. Source: GM Inside News.



AUSTRALIAN NATURAL GAS FOR AUSTRALIAN FERRIES AND SHIPS

As an island nation, Australia is also a shipping nation. Shipping carries 99% of Australia's trade by volume and Australia's shipping makes up 10% of the entire world's seaborne trade.

Ships move nearly a billion tonnes of iron ore, coal, wheat and other goods in and out of Australia's ports each year and shipping growth is anticipated to be around 80% over the next decade.⁵⁵ The competitiveness of our shipping is essential to the strength of our economy and Australia is home to a significant ship-building industry, particularly in South Australia, Victoria and NSW.

Diesel-powered ships and ferries cruise over our Great Barrier Reef, around our harbours and up and down our coastline. But if they were powered by cleaner, cheaper, safer natural gas, it would further reduce the risk of fuel spills and pollution. That's because natural gas vaporizes or dissipates into the air instantaneously. Natural gas is a Great Barrier Reef and water friendly fuel.

The use of natural gas in ferries is taking off around the world. Norway runs 20 ferries fuelled by natural gas. Trials are also underway in Washington and ferries are under construction for Argentina, Uruguay, Sweden, and Finland.⁵⁶

Australia has played a positive role in contributing to the growth of natural gas ferries. A natural gas powered ferry was built by INCAT in Tasmania, for example, but was not sold here in Australia but to South America. The Argentinians are enjoying the benefits of an Australian company's innovation – yet there has been surprisingly little action from Australia's state-owned ferries to upgrade to Australia's cleaner, cheaper fuel source.

Interest in INCAT's natural gas powered ferries is growing worldwide and yet Bass Strait ferries, Sydney ferries, Brisbane ferries, and Perth's ferries are yet to switch to natural gas as a fuel source. We are leading the world in design and technological know-how in this space but are failing to capitalise on our local knowledge and on our local fuel. INCAT is yet another demonstration that places like Hobart, in Australia, can offer world leading manufacturing – and combining that entrepreneurial spirit with the natural advantage of Australian natural gas fuels is compelling.

SeaRoad, a Tasmanian based company, announced they have ordered a purpose-built vessel to service the Bass Strait that will be fuelled by LNG. The decision was made to opt for LNG as fuel reflect environmental responsibility. Source: SeaRoad.



AUSTRALIAN NATURAL GAS FOR AUSTRALIAN TRAINS

Rail carries a great deal of our goods and commodities around Australia and the cost-efficiency of our rail systems contributes significantly to our international competitiveness.

In 2008, for example, 719 million tonnes of freight was moved by rail in Australia⁵⁷, however the cost of rail freight in Australia is higher than other comparable countries. For example, average rail freight costs for bulk and non-bulk have been found by one study to range between \$32.04 and \$26.43 (AUD) per net thousand tonnes per kilometre in Australia in 2006⁵⁸. In 2009, in the United States, the average was \$17.29 (AUD) per net thousand tonnes per kilometre to transport coal from coal basins to power plants (bulk freight).⁵⁹

Although these are basic comparisons, they illustrate that Australia's rail freight network is expensive. The imperative to cut these costs is large when it comes to boosting our competitiveness in the global economy and diesel prices in the future will only get higher.

There is also growing community concern around the health hazards of diesel-fueled trains, particularly in communities like the Hunter Valley, which has significant rail infrastructure to deliver coal to Newcastle port.

Commenting on a report into the impact of diesel in the Hunter Valley, the Chair of the NSW Environment

Protection Agency, Barry Buffier said that diesel emissions have a significant impact on air quality and diesel emits particles that are "the particles of most concern to human health" and that "there are currently no national regulations that apply to emissions from non-road diesels or diesel locomotives in Australia".⁶⁰

Furthermore, carbon emissions from the rail sector are due to grow by around 50% from 4,536,300 tonnes of CO₂ in 2005 to 6,751,400 by 2025.⁶¹

Carbon emissions from the rail sector are due to grow by around 50%.

There is therefore a real and immediate emissions reduction imperative that development and implementation of natural gas rail locomotion can assist with.

Several companies in the United States are working to develop natural gas locomotive trains. There are predictions that natural gas could revolutionise the rail industry in the US much like the transition from steam to diesel post WWII. While there is no expectation that diesel will be replaced completely, locomotive makers are looking at how to retrofit existing machines to burn a mix of diesel and LNG.⁶²

The issue is whether Australia can act quickly enough to be internationally competitive by using Australian natural gas fuel in the same way the US is aiming to use US natural gas to transform its rail industry.

As a huge nation dependent on rail and trucks to move goods thousands of kilometres— especially our export commodities in a competitive world, this is an area Australia should be seeking to be a first mover in.



Source: Bloomberg

Carbon emissions from the rail sector are due to grow by around 50%.

AUSTRALIAN NATURAL GAS FOR REMOTE POWER GENERATION

There are over 400,000 Australians in remote regional communities and thousands of industry and business sites that require off-grid electricity.

While a number have access to natural gas powered generation now, many are dependent on more expensive and in many cases dirtier liquid fuels. They deserve a cleaner, greener, cheaper replacement for diesel.

And demand for remote and off-grid power is growing due to resources development in regional Australia, according to the Bureau of Resources and Energy Economics (BREE).⁶³

The use of diesel transported to these communities as a source of electricity makes the cost of delivering electricity to these communities exceptionally high. It is costly for the individual communities, for local industries and for the taxpayer (due to cross-subsidisation through various grant and Community Service Obligation commitments).

Transitioning to natural gas fueled generation makes sense in terms of lowering the cost of electricity supplied to these remote communities. Due to the dependence on off-road subsidy for diesel, switching to natural gas is not

only more cost effective for government coffers, it's better for air quality in those communities.

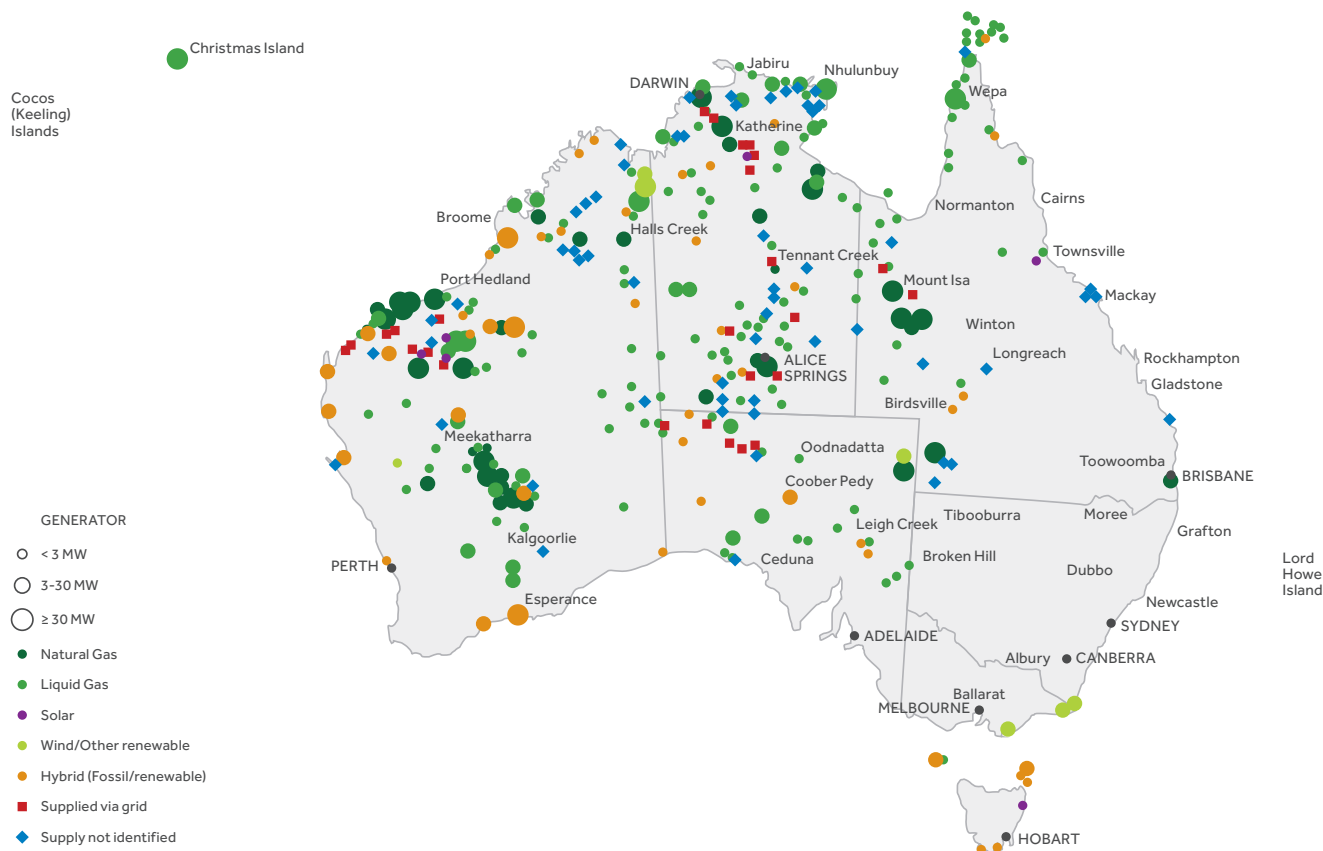
Almost 80% of off-grid electricity generated in 2011-12 was from natural gas, reflecting "the high proportion of resources and energy operations located in remote areas supplied by natural gas pipelines, such as the Pilbara and Mt Isa regions".⁶⁴

However, as BREE has noted, there is a lack of data publicly available regarding the size and composition of off-grid electricity demand and supply.⁶⁵

There would also be merit in State and Federal Government collaboration on improving the availability of data through 'open data' government release of information in order to facilitate better market responses than existing programs.

Renewable energy sources only account for around 2% of stationary electricity generation owing to its lack of reliability. BREE found that while there is potential for improvement in this area, technology will take some time to progress.⁶⁶

Off-grid electricity generators Australia, 2011-12. Source: Bureau of Resources and Energy Economics



AUSTRALIAN NATURAL GAS FOR MANUFACTURING, PROCESSING AND COOKING

With the closure or announced closures of several refineries across Australia, comes the unintended consequence of a number of businesses across Australia losing their fuel supply for manufacturing, processing and cooking.

Having large gas reserves means that natural gas is a sensible alternative fuel, as well as being cleaner and cheaper. Already across Australia natural gas fuels are being used to process dairy products, at an asphalt plant and to produce food in regional Queensland.

Australian natural gas can help to keep skills and manufacturing jobs in Australia and give us a competitive advantage.

The natural opportunities for Australia from natural gas fuels



CRITICAL GAS SUPPLIES DELIVERED TO WHYALLA HOSPITAL

CASE STUDY 2

Natural gas is easy to transport, in either a compressed or liquid form and is able to be converted back into a gas form for injection directly into gas pipelines and networks.

A recent pipeline rupture in Whyalla, South Australia, meant that parts of Whyalla including Whyalla hospital risked being without gas while repairs were made.

As a company with an existing domestic LNG network, BOC was able to send an expert technician and innovative tanker to South Australia to convert the LNG back to natural gas for injection into the Whyalla pipeline network and restore critical gas supply to the hospital.

5. CHALLENGES TO OVERCOME

THE IMPEDIMENTS TO GROWTH OF NATURAL GAS FOR TRANSPORT

Despite the clear and multiple benefits of using natural gas for Australia's transport purposes, the future of transport and stationary natural gas is far from assured.

Developing the infant transport natural gas fuel industry and setting it on the pathway to this 2030 Vision requires the sector to overcome a range of impediments. Some are market-based but some are artificial distortions of the market that need to be remedied.

APPROPRIATE TAX AND POLICY SETTINGS

The primary reason for the limitation in the uptake in transport natural gas fuels has been the great difficulty in competing with diesel, which has become further entrenched in recent years as the dominant fuel in the market. As the Federal Government's own Strategic Framework for Alternative Transport Fuels recognises, the market can't operate effectively or transition smoothly.⁶⁷ Indeed, it also highlights the negative economic impact of entrenched fuels blocking the opportunity for better, cleaner and cheaper fuels to come to market.

Even in situations where the alternative transport fuel may be cheaper, the dominance of conventional fuels in the transport market is a significant market entry barrier for alternative transport fuels. Delays caused by the strong lock-in effect of incumbent fuels and technologies in the transport system may result in a less than optimal outcome for the economy due to forgone opportunities (and options) to fuel switch when more cost-competitive fuels and fuel technologies become available.⁶⁸

Diesel has received the benefit of relatively low taxation rates and relatively high subsidies throughout the twentieth century. It therefore had a significant first

mover advantage that has been entrenched by decades of specific policy and taxation support in Australia.

Despite the Government's commitment to developing alternative fuel sources for transport, the premature imposition of excise on natural gas fuels in 2011 has significantly impacted the growth and competitiveness of the fuel vis-à-vis fuel and is continuing to increase.

The intent of this program was to establish a new status quo where natural gas and LPG are taxed at 50% of the rate of diesel or petrol on an energy equivalent basis.⁶⁹

With this tax increase, the benefit of LNG and CNG from the repeal of the carbon tax is outweighed by ongoing excise increases, the reintroduction of fuel excise indexation and these burdens contradict previous and current government policies that this burden should not exceed 50%.

Unfortunately, the premature imposition of the excise has made natural gas unable to compete with diesel and this has resulted in the market stagnating considerably. The introduction of excise quickly whittled away the cost benefit of fleet-owners shifting to natural gas when the upfront costs of engine conversion are taken into account.

This has put transport natural gas fuels at a distinct disadvantage to diesel in the market and as a result, transport natural gas volumes have dropped dramatically.

The excise rate has therefore had the unintended consequence of severely impairing an industry that was still in its developing stages.

The decisions in May 2014 to freeze the road user charge (RUC) for diesel heavy vehicles and reintroduce fuel excise



Australian natural gas fuels are already powering real trucks in Australia. Source: IntelliGas.

indexation means that the fuel tax on transport natural gas as a proportion of the tax on diesel on an energy equivalent basis will be 59% for LNG and 64.5% for CNG as at February 2015.

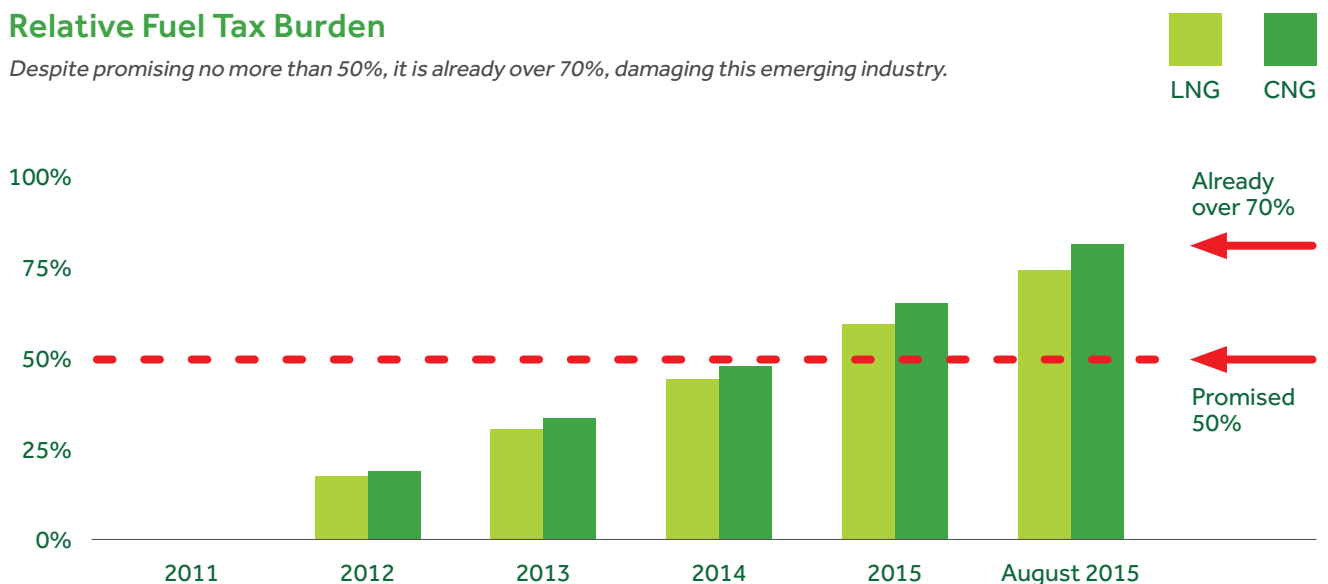
Even now that the carbon tax is repealed, scheduled excise rises and excise indexation, combined with the RUC increasing by the amount recommended by the National Transport Commission will push the relative tax burden on natural gas fuels to over 70%.

Furthermore, the uncertainty around excise arrangements are putting a hold on the purchasing decisions of some fleet operators as they are currently unable to make long-term business decisions without adequate pricing information.

Industry has been taking a proactive approach. But we can't ask industry leaders – facing a range of challenges – to shoulder the leadership role alone. The effect on alternative fuels of tax changes is far greater than both sides of politics expected and promised. It is therefore necessary that industry and the Federal Government work closely together to revisit the trajectory of the excise imposition while this infant industry builds to a critical mass and realises Australia's natural advantage.

Relative Fuel Tax Burden

Despite promising no more than 50%, it is already over 70%, damaging this emerging industry.



WHAT FEDERAL PARLIAMENTARIANS HAVE SAID ABOUT TAXING TRANSPORT NATURAL GAS:

When in Opposition, the Coalition acknowledged – that the imposition of excise tax on transport natural gas was contrary to Australia’s national interests. For example, during the second reading debate for the excise legislation, the following points were noted:

SENATOR GEORGE BRANDIS, NOW ATTORNEY-GENERAL

“This is bad legislation. It is not about improving efficiencies in this country. It is not about ensuring that Australia is a better place to live. It is legislation about taxing a fuel source which we have in abundance. It is legislation about taxing a fuel source that is efficient. It is legislation about taxing a fuel source that is a low emitter.”

WARREN TRUSS MP, NOW DEPUTY PRIME MINISTER

“The opposition will not support the government’s new excise on LPG, LCG and LNG, which will unfairly discriminate against public transport users, taxi users and motorists, who have invested in good faith in a clean fuel.

For a government that likes to pride itself on, and argue in the media about, its environmental credentials and that wants to impose new taxes to reduce CO₂ emissions and to be a world leader in addressing climate change, this bill is incredible—a bill that will impose a tax on some of fuels that could in fact make a real difference.”

IAN MACFARLANE MP, NOW MINISTER FOR INDUSTRY

“They will apply a tax to the taxi fleet. They will apply a tax to the public transport systems, particularly those of cities such as Sydney, Perth and Brisbane, whose buses use compressed natural gas not only to lower emissions but also to lower pollution. These buses burn cleaner and provide Australia with an opportunity to use some of the overwhelmingly ample resources that we have in natural gas.”

“It makes no sense to apply a tax on those fuels.”

Labor, then in Government, also said at the time that it would watch closely for any unintended consequences:

BILL SHORTEN MP, THEN ASSISTANT TREASURER

“Accordingly, the Gillard government will review the operation of the legislation after 30 June 2015 as it applies to LNG, CNG and LPG. At this time, a review of this longstanding policy will be timely given broader energy issues, including a carbon price. It would also be an appropriate time to analyse industry compliance costs, particularly in the LPG sector. Such a review can also consider issues such as the size of the alternative fuels sector and the market growth of these industries.”

INITIAL CONVERSION COSTS

CSIRO modeling has shown that natural gas fuel savings in trucks appears to be sufficiently high to overcome upfront costs of transition for a significant portion of the road freight sector⁷⁰.

However, due to the lumpy and significant nature of the upfront investment, these costs – which can be up to \$110,000 for trucks to be upgraded – act as a strong short-term disincentive.

The tightening of the differential between diesel and natural gas fuel prices following the excise imposition has compounded the immediate term disincentive to invest, given the payback period has lengthened. Previously, fleet owners were willing to invest in the upfront costs of conversion knowing that they would get a good return on investment as a result of lower ongoing fuel costs.

Despite the benefits of lower fuel costs, natural gas powered trucks using Liquefied Natural Gas (LNG) or Compressed Natural Gas (CNG) carry some form of initial price premium prior to use, the same as vehicles powered by most other alternatives to crude oil based fuels. This is true whether buying a factory fitted natural gas truck or converting an existing petrol or diesel truck.

Consequently, truck owners or fleet operators contemplating using a natural gas powered truck must carefully assess the length of time before lower fuel costs recoup or 'payback' the price premium of a factory fitted or converted natural gas truck. Ideally, this period or 'break-even' point will be no more than two years.

In practice, the 'break-even' point of a particular natural gas powered truck will depend on a number of factors including:

- its natural gas vehicle price premium;
- how much fuel it uses (which in turn depends on the distances it will travel and its fuel economy with various loads);
- the relative price of the natural gas fuel it uses (e.g. LNG or CNG) and diesel and the extent to which it can substitute gas for diesel;
- its non-fuel running costs (e.g. servicing and maintenance) are relative to comparable diesel trucks; and
- the relative tax and other government charges imposed on particular natural gas and diesel trucks and the fuel they use.

For example, a selection of typical long haul trucks converted to run on LNG and operated by a large fleet operator would require a wholesale diesel price of somewhere between \$1.30 and \$1.50 per litre to 'break-even' after two years given current LNG prices and tax arrangements. CNG trucks would require similar wholesale diesel prices to 'break-even' after two years given current CNG prices and tax arrangements.

A key contributor to the current difficulty natural gas fuels face in competing with diesel is the scaled program to impose excise on gaseous fuels over a four year period that began in 2011. For example, in the absence of excise on LNG, a large fleet operator would require a wholesale diesel price of somewhere between \$1.10 and \$1.30 per litre to 'break-even' after two years given current LNG prices. This range suggests some LNG trucks might be able to 'break-even' even if current low oil prices were to persist.

The uptake of LNG would be more sustainable if this cost of conversion was more easily overcome – for example, by harnessing economies of scale, encouraging R&D and allowing for accelerated depreciation. Such breaks are consistent with proper efforts to facilitate emerging industries and, currently, with the Abbott Government's direct action agenda. With scale, cleaner cheaper natural gas fuels can compete with entrenched diesel.



Together with their partners, Australian company IntelliGas have developed technology to retro fit a range of mine vehicles including trucks, dozers and shovels, which can be fitted with a HDCNG fuel system on site, reducing emissions. Source: IntelliGas.



From a public policy perspective, the relatively small amounts of revenue collected as a result of the imposition of excise on transport fuel LNG and CNG need to be assessed against the forgone community benefits in terms of reduced greenhouse gas emissions, tailpipe pollution, noise and increased regional development and energy security, that would flow from greater displacement of diesel trucks by natural gas trucks.

In addition, it is critical that governments take a long term perspective when framing energy policies – the infrastructure needed to deliver fuel diversity and energy resilience cannot be built overnight in response to a sudden disruption to supplies or hike in prices. In this context it is worth noting that the Bureau of Resources and Energy Economics 2014 Australian Liquid Fuels Technology Assessment concluded that gaseous fuels offer the lowest production costs now and over most of the report's projection period to 2050 and are expected to be cost competitive with lower cost renewable technologies over the same time-frame.

INFRASTRUCTURE LIMITATIONS

Australia has an existing natural gas pipeline network and the technology for liquefying/compressing natural gas is well developed.

However, only a very limited number of publically accessible natural gas fuelling stations are currently available in Victoria, Queensland, Tasmania and Western Australia. Natural gas fuelling stations need to be established at major freight hubs.

Only if the market improved sufficiently enough for there to be a viable proposition for new refueling stations would a wider rollout of the network take place.

There is a strong case, as part of the appropriate transitional support for this infant industry, to consider

accelerated depreciation or direct assistance for relevant infrastructure, as occurs in other countries. This would be consistent with the Government commitment to facilitate the growth of such infrastructure along major highways.

EARNED RELIABILITY REPUTATION

The reputation for reliability of diesel and petrol has been built up through decades of use. While natural gas can hold its ground against both fuels in this area, it will take some time to establish a widespread reputation for it.

Despite their proven technical capabilities, alternatives to diesel and petrol have to work harder to prove themselves in the market as contenders and this process takes time.

CONFUSION REGARDING ALTERNATIVE FUELS AND TECHNOLOGIES

An important trend in business over the past 15 years has been the increasing appeal of sustainability as a business consideration. While this has broad benefit, it has also led to confusion in the marketplace as to what technologies or fuels are most suitable to replace or supplement diesel or petrol.

Choices include hybrid vehicles, plug-in hybrids, biodiesel, natural gas, ethanol, and LPG among others. Within these categories are different 'formats' for the fuel, different blends of fuels and the option of first, second or third generation biofuels. Even among gaseous fuels, there is often confusion over the difference between LPG and natural gas.

Each fuel or technology has its strengths and weaknesses and fleet operators do not have the luxury of being able to experiment or trial the different options or, in some cases, even to research them to a sufficient degree to allow them to make an informed choice.

Marketing studies have demonstrated that often, when faced with too many choices, let alone an uninformed choice, buyers often choose the status quo. In the transport context this usually leads fleet operators to the status quo fuels of diesel and petrol, while looking to other measures to improve fleet sustainability. This means that the community benefits of high impact alternatives that deliver high crude displacement levels, such as natural gas, are not realised and the community advantage is lost.

The industry must help itself by highlighting the realities and weaknesses of alternative fuels and technologies in the Australian context; solar power can't drive a truck from Perth to Gladstone.

REGULATORY BARRIERS

As noted by the Federal Government's Strategic Framework for Alternative Transport Fuels, there is regulatory inconsistency between states and territories with respect to heavy vehicles. Natural gas vehicles require larger fuel tanks to store enough energy to achieve a similar range to conventional heavy vehicles. To accommodate the large fuel tanks, gas-powered heavy vehicles can suffer a payload penalty (resulting in reduced transport carrying capacity) in order to meet dimension and mass requirements.

While approval for greater length or higher mass limits of heavy vehicles can be requested, network access

regulations in the different states and territories vary to ensure important elements such as the structural integrity of bridges. This variation in regulation can result in multiple access permits being required for interstate transport routes, which increases their costs and regulatory burden.

Allowing suitably constructed trucks with natural gas tanks to operate at up to 7.0t on steer axle (+500kg over current permit limit) would be a simple method to overcome the tare weight disadvantage for the natural gas on board storage.

The State and Territories and industries should work with the Australian Government to harmonise these regulatory requirements so that they do not begin to act as a brake on natural gas road transport expansion.

The unique storage requirements of natural gas fuels add weight to vehicles, which usually manifest in a weight penalty and sometimes a length penalty depending on how the fuel is stored on the truck. For fleet operators who are sensitive to weight and length, this can mean a trade-off in the form of lost revenue as they may not be able to use the vehicle to the same capacity than if it were operating on diesel.

The regulation of natural gas trucks should allow for additional weight and/or length of a gas vehicle over and above its diesel equivalent. Such schemes have been introduced internationally and allow fleet operators to maintain a payload that matches a diesel equivalent.

Driver accessing the LNG refuelling station at Kewdale, Western Australia. Source: EVOL LNG.



THE STORY OF THE FUEL MARKET DYSFUNCTION – WHAT IS STOPPING NATURAL GAS?

Diesel will continue to be an important fuel for the intermediate term. However, there is no escaping the fact it will be increasingly imported and not produced in Australia. Diesel has been entrenched and had monopolistic dominance for over 100 years, stifling out competition from better fuel options simply because it takes time to build economies of scale.

Australia is becoming more reliant on imported, dirty, increasingly expensive diesel.

Just as Detroit killed alternative engine and fuel technologies in its own interest over many years – and look where that got them – Australia's natural gas fuel advantage is being lost unless we help it to genuinely compete with imported diesel.

Diesel still enjoys taxpayer cross subsidisation and sympathetic policy settings, which means it is not a free market and not an even playing field.

While natural gas has an equivalent energy unit cost advantage and compelling advantages from an emissions perspective, the upfront costs of converting fleets, building engines and developing infrastructure mean it is hard even for the better fuel to compete.

We know that given the current reliance of Australian industry on diesel it is both economically and politically impossible for the Government to immediately withdraw longstanding assistance for diesel and its users.

But it also means you can't impose extra taxes and expect natural gas to overcome the longstanding and supported position of diesel without transitional, reasonable government support and policy settings.

In the long term, both fuels need to compete on their merits, but that requires reviewing the excise tax rate and addressing other policy barriers for natural gas and a faster, albeit gradual reduction in tax support for diesel to ensure truck owners will buy the initially more expensive trucks and Australia is less exposed to the costs and fluctuations in the supply of diesel by 2035.

A report released by the Department of Resources, Energy and Tourism in 2011 titled 'Strategic Framework for Alternative Transport Fuels' stated that:

"Even in situations where the alternative transport fuel may be cheaper, the dominance of conventional fuels in the transport market is a significant market entry barrier for alternative transport fuels. Delays caused by the strong lock-in effect of incumbent fuels and technologies in the transport system may result in a less than optimal outcome for the economy due to forgone opportunities (and options) to fuel switch when more cost competitive fuels and fuel technologies become available."

Entrenched dirty diesel and the market dominance it enjoys, together with the current tax settings are stopping Australians from easily accessing cleaner, cheaper natural gas fuels.

CONSUMER CHOICE

There is currently a lack of natural gas capable trucks supplied to the Australian vehicle market. To make matters worse, the 15L engine that we once imported to service our unique need in Australia for bigger, heavier trucks that can run long distances, has now been discontinued in Australia.

There would be merit in seeking to develop our own technology and lead the world in the research, commercialisation and manufacture of these vehicles.

There is, however, unfortunately a chicken-and-egg situation here in the market. Lack of consumer choice around trucks leads to lower uptake of natural gas and decreased uptake of natural gas due to reduced cost-effectiveness following the imposition of the excise is likewise reinforcing the restricted choice when it comes to vehicle availability.

We need to move to build up our capacity and our range of vehicles for fleet-owners – and this is where the

Government's role in R&D and shifting manufacturing policy to modern, niche industries could be relevant.

Our vision is for Australians to have a choice of fuels available to them.



Higher costs of foreign fuels flow right through the Australia economy, making the cost of goods more expensive. Australia needs to use its own cheaper fuels that are kinder on our wallets. Source: Perth Now.

AUSTRALIAN DESIGNED AND MANUFACTURED REFUELLING STATIONS (BAUER)

CASE STUDY 3

Founded in Sydney in 2010 as a subsidiary of the international Bauer Group, BAUER KOMPRESSOREN Australia (BKA) is a world leader in manufacturing compressors and refuelling systems for CNG fuels.



BKA are pioneers in refuelling system technology and using Australian skills and expertise have developed a robust “drop and go” innovative containerised system that allows refuelling systems to be dropped on-site, plugged in and ready to operate. This saves time and money during construction.

BKA also designed and manufactured a certified CNG dispenser for fuel sales such as public refuelling with state of the art electronics and dispensing components.

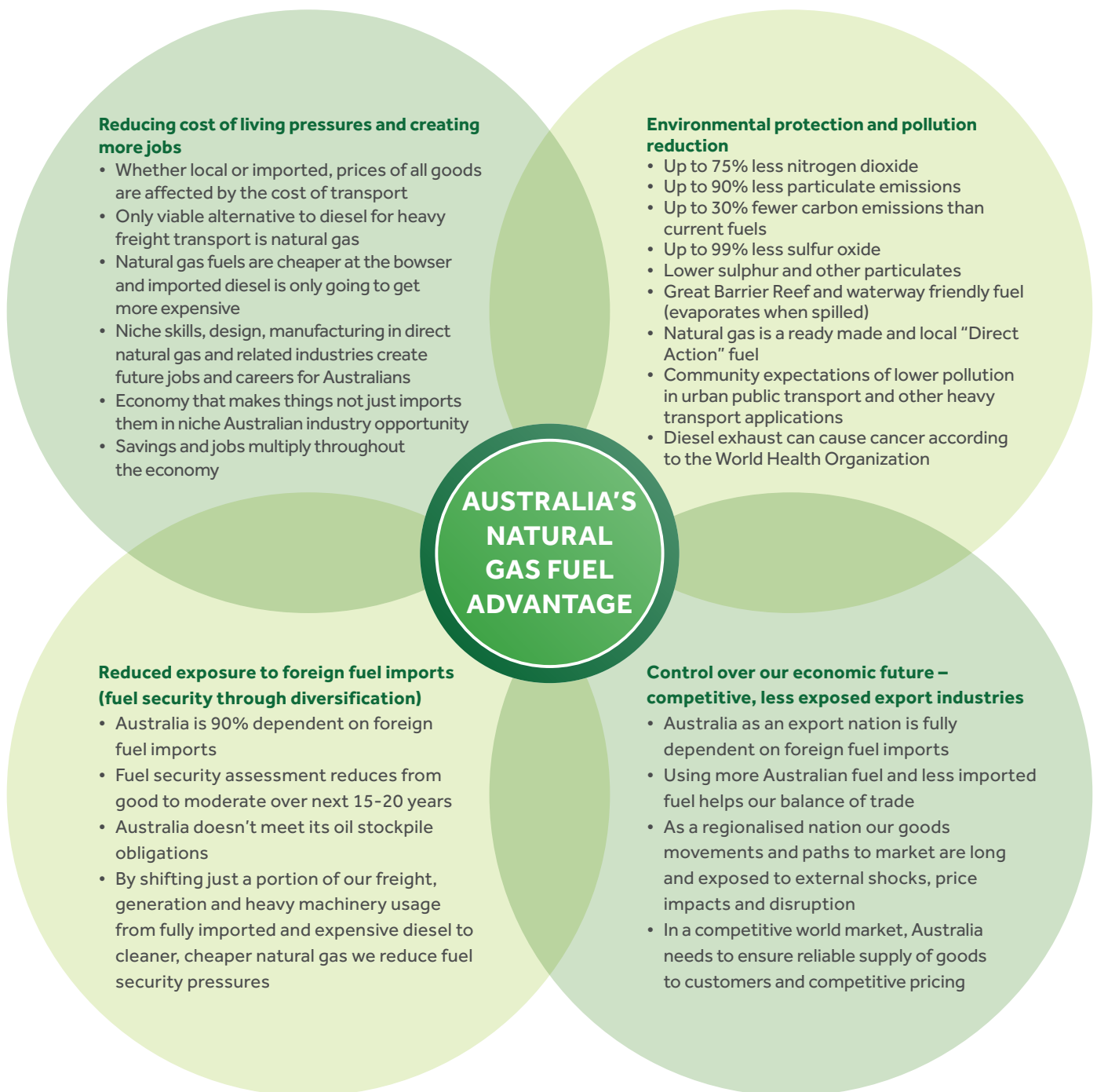
BKA also has the capability of full turnkey engineering design and project management solutions with additional national aftermarket support throughout the region.



Designed and made in a local plant at Wetherill park in Sydney's West, the network of refuelling stations for different sized vehicle refuelling has been supplied to small to medium to large size companies which use CNG for forklifts, delivery trucks and bus depot fleets which in turn refuel over 1500 CNG vehicles and nationally support over 50 jobs.

Natural gas fuels are our natural competitive advantage and we need to keep the skills and manufacturing jobs here in Australia for now and in the future.

The role of government and industry together is to facilitate the steps to realising our natural gas fuel advantage – in the public interest and the economic interest of Australia



6. CONCLUSION

Australia is faced with a clear choice when it comes to our dependence on foreign fuels sources:

Less control over our economic future. We can continue to rely on and even encourage through our taxation settings our continued reliance on foreign oil for transportation purposes, which is projected to become increasingly expensive and poses serious risks to our economic growth and stability;

OR

More control over our economic future. We can tap into our natural advantage and promote the growth of natural gas fuels for transport purposes, to insure against major risks and shocks to our economy, to grow local industries and jobs and to improve our environment.

Australians clearly want more rather than less control over our children's future and natural gas clearly meets a number of important Government policy goals. There is a clear public interest need to develop this Australian-sourced fuel.

The triple drivers of cost, environment and the need for an increased proportion of future sustainable, secure and reliable domestic fuel supply mean it is important to take the necessary steps to ensure natural gas is a key part of Australia's energy mix.

Waiting for the market to respond organically will not work for this infant industry with current policy settings in place. The market will respond too late. Australia needs to act to ensure that we secure our energy future, take care of the environment, and help our economy to grow using Australia's natural advantage – our natural gas.

The opportunities and advantages for natural gas as a transport and stationary energy fuel source are compelling. It's cleaner, it's cheaper at the bowser and it's less susceptible to disruption as our future fuel security declines.

And natural gas fits neatly with key Government agendas. It can contribute to lower emissions through direct action and offers niche Australian job and industry opportunities by building on our natural advantages and supporting our strategically important export industries.

BREE has confirmed that natural gas fuels have the lowest production costs out to 2050 and communities are increasingly demanding clean air and a need for less polluting fuel.

But, it requires a committed partnership between a willing and proactive industry, and a committed government that wants to take the first steps to seizing this opportunity and delivering more control over Australia's economic future.

There is a clear public interest need to develop this Australian-sourced fuel.

7. ABOUT



GAS ENERGY AUSTRALIA

Gas Energy Australia is the national peak body that represents the bulk of the downstream alternative gaseous fuels industry which covers Liquefied Petroleum Gas (LPG), Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG).

The industry comprises major companies and small to medium businesses in the alternative gaseous fuels supply chain – refiners, fuel marketers, vehicle and equipment manufacturers, vehicle converters, consultants and other providers of services to the industry.

The Association's mission is to optimise the value and benefits of gaseous fuels for the benefit of Australia's

national interest – to achieve energy security and economic prosperity in a lower carbon economy, and the Australian community in providing access to affordable energy.

The Association focuses on advocating the value and benefits of the fuels through engagement with the federal government, state authorities and the community.

CLEANER, CHEAPER, AUSTRALIAN FUELS CAMPAIGN

In November 2014, Gas Energy Australia launched their campaign for Cleaner Cheaper Australia Fuels.

As part of our campaign, we are seeking community and industry feedback on our 2030 Vision consultation paper on natural gas fuels.

The paper explores the current use of natural gas as a fuel in Australia, the barriers to its uptake, the potential for its increased use and the associated benefits.

Initially in two consultation papers, one specifically about liquefied natural gas and one on compressed natural gas, the two documents have now been

merged in response to feedback we received during the consultation process.

The 2030 Vision document has been distributed to over 400 stakeholders including politicians, as well as industry and community representatives. We have received over 30 informal comments, met with over 30 Members and Senators and received responses to our campaign from numerous industry bodies.

Consultation on our 2030 Vision is closing soon.

To learn more about our campaign, our 2030 Vision or to give us your feedback, visit our campaign website www.cleanercheaperfuels.com.au.

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Gas Energy Australia
ACN 002 703 951 ABN 11 002 703 951

Incorporated in New South Wales as
a Public Company limited by guarantee
Inaugurated 1958 Incorporated 1984

Suite 7, 16 National Circuit,
Barton ACT 2600 Australia

Phone 02 6176 3100

Fax 02 6176 0207

Email mail@gasenergyaustralia.asn.au

www.cleanercheaperfuels.com.au