

# LPG as a transport fuel



## SOME CONSIDERATIONS FOR THE CONTINUATION OF LPG IN AUSTRALIA

According to a recent report by ABMARC, Australia's authoritative source for unbiased and comprehensive analysis of conventional and alternative powertrains, energy, transport and fuels, policies in Australia will increase the costs of buying, converting and operating a vehicle with LPG.

The Powertrain Series of reports have been created to give technical and non-technical readers in both business, advocacy groups and Government accurate and objective information that can be relied upon to assist in making critical long-term planning, strategic or policy decisions.

*The Liquid Petroleum Gas Australia: An Automotive Perspective Report* covers in depth global government LPG vehicle policies and compares them to Australia's current and future position.

ABMARC illustrates that whilst many environmentally progressive countries are actively supporting LPG for improved air quality, and a number of developing nations are promoting it to enable greater social mobility, Australia's policies will increase the costs of LPG.

Natalie Roberts, Principal Engineering Consultant at ABMARC, draws on the latest report released 21st February 2012, in her article.

*From the desk of Natalie Roberts*

LPG is primarily a mix of the hydrocarbons propane and butane, it is heavier than air, a liquid at

pressures not much higher than atmospheric and it is found in 'wet' conventional natural gas, oil and condensate fields. LPG is produced during the extraction of natural gas or during the refining of oil, and is considered by many to be a by-product as it not the principal resource that energy companies are seeking to produce.

Ensuring a market for LPG is like the foodies' philosophy of consuming the "whole beast" – where all parts of the animal are eaten, not just the prime cuts. If LPG cannot be utilised, or a ready and established market with distribution and supply chains is not in place, it will often be 'flared' by the energy company, a process where it is simply burnt off. With growing awareness of the need to conserve energy resources and limit the release of carbon dioxide into the atmosphere, the use of LPG meets the common sense test.

As LPG can be easily stored and transported, it lends itself to automotive use. It has a relatively high energy density – using only a 30 percent greater volume than petrol per kilometre travelled. LPG is safe and clean burning, and vehicles capable of meeting Australia's current light vehicle emissions standards are delivering tailpipe CO2 emission reductions of between 7 percent and 15 percent when compared to the equivalent petrol engine that they replace.

Despite the above, the automotive consumption of LPG in Australia

has been declining. Could it be that Australia's long history of automotive LPG use has resulted in it being considered as unfashionable within sectors of the community and Government? Especially now when there are more powertrain (propulsion and drive system) options available and marketing has seen diesel cars now being considered 'clean, stylish and European' and Electric Vehicles as being the ultimate 'eco-friendly' way to travel.

Australia's Federal Government LPG policy landscape is in stark contrast to many other countries, where governments are supporting and promoting the uptake of LPG. For example, the USA promotes LPG for "energy independence", Europe encourages it for its ability to reduce CO2 and noxious emissions, South Korea for social responsibility, India and other developing nations as a way to improve air quality whilst at the same time promoting economic opportunity through lower vehicle operating costs.

### Reasons to consider

Reasons to consider LPG's continuation as a transport fuel in Australia fall under three broad headings: energy security; enabling mobility, and improved environmental outcomes.

Before we explore these points in detail, we should review some features of automotive LPG systems. The automotive LPG systems of today are proven and mature technologies and really not comparable to the older style, single point injection system (mixer

systems), that operate in a manner similar to a carburettor. The older mixer type systems have been in regular use until recently and are still used in conversions on older vehicles. Current technology LPG systems that are properly integrated and calibrated in either dedicated LPG or dual fuel format provide vehicle operation that is equivalent to petrol, whilst innovative new tank designs are more space efficient and provide improved vehicle integration opportunities. This analysis is further supported by objective technical evaluations conducted as part of the ABMARC LPG report, that covered three vehicles with three different modern LPG systems. It was evident from the results, that each of the cars was highly capable and comfortable, provided the operator with substantially reduced fuel costs (in each case more than 45 percent - when operated in Victoria), CO2 reductions of up to 15 percent and there was no compromise in performance, start quality or driveability – areas that historically have been adversely impacted by the use of LPG.

#### 1. Energy Security

LPG is indigenous to Australia and at moment more than 70% is produced from natural sources (such as gas fields). This makes Australia's ability to produce LPG relatively independent of the refining industry. As a nation we are a net exporter of LPG, so there is scope for its increased domestic use and potential to positively assist our national terms of trade as it displaces imported refined petroleum products. Known LPG

resources are strongly linked to natural gas, and the long term economic resources of both have been increasing, a trend ABMARC believes will continue due to increased energy exploration.

In 2011 the Federal Government conducted a "National Energy Security Assessment," (NESA) as an input into the draft Energy White paper (which was conducted by the Department of Resources, Energy and Tourism, draft released December 2011). The assessment reported that Australia's liquid energy security outlook is deteriorating, moving from a "high" rating to "moderate" from 2016. Laying this information over the ABARE (now BREE) data that forecasts domestic petroleum consumption, production and imports (refer to 'Australia's Oil and Liquid Energy Security Forecast' chart) it is clear that it is not just the external factors of decreasing political stability in oil producing regions identified by NESA that is making Australia more vulnerable – it is also our decreasing domestic oil production and a resultant increase in our reliance on imported fuels to sustain growing domestic demand that is impacting our future liquid fuel security.

Australia's LPG infrastructure, supply and distribution chains are well established and worth billions of dollars with market penetration of LPG at service stations is currently at 57 percent. In South Korea, which has the highest number of LPG vehicles on the road, it is estimated that fewer than 20 percent of service stations have LPG available and those that do are typically LPG only (no petrol or diesel).

It could be considered sensible for Government to put measures in place that support and improve

Australia's mid and long term energy security needs, especially given that a deteriorating liquid fuels outlook is forecast. LPG is readily available and can continue to play an important role as part of an Australian transport energy security solution. LPG satisfies the resource and infrastructure tests for energy security: it is locally available and continued automotive use will maintain its availability to consumers on the service station forecourts.

### 2. Enabling Mobility

As part of the LPG report, ABMARC conducted an LPG user survey. It identified the socio-economic benefits of LPG in providing mobility to families, pensioners and low income earners. It showed that LPG owners typically drove SUVs or large passenger vehicles, lived in the outer suburbs and had lower incomes than the reference group. It was clear that LPG was used to help balance household budgets or enable family activities such as caravanning or horse riding. Significantly, 72 percent of respondents believed that if they didn't have the option of LPG, they could not afford to operate their vehicle or would have to reduce their vehicle use or activities.

The number one reason that survey respondents chose to buy or convert to LPG was to lower their vehicle operating costs. There is a price premium for an LPG vehicle that requires a 'return on investment'. Travelling high kilometres or operating a vehicle that has high fuel consumption will assist in shortening this period – however, a return on investment requires a price differential between LPG and petrol. Some of the challenges facing the sector at the moment are the introduction of the alternative fuels excise, which when fully

implemented will add 12.5 cents per litre plus GST to the price of LPG – reducing the fuel price advantage, and the phasing out of the LPG conversion and new vehicle scheme that currently provides a grant for private buyers.

ABMARC's modelling for private buyers shows that the impact of the alternative fuels excise and removal of the LPG scheme will increase the payback period of an LPG conversion (large passenger sedan travelling 25,000km per year) from 2.1 years in November 2011 to 3.8 years by July 2015.

### 3. Improved Environmental Outcomes

There are conflicting accounts of the environmental benefits of using LPG in vehicles which has arisen due to the fact that not all LPG systems perform equally. To explain a little further, the old style 'mixer' system discussed earlier may not provide any CO2 reduction benefits when compared to the equivalent petrol engine (and in some instances they are worse!). These older systems are not capable of meeting today's vehicle emission standards. Modern, sequential LPG injection systems have been available for a number of years and can meet or exceed the current Euro 4 standards. Some are already capable to meet the more stringent Euro 5 standards. In our analysis of almost 20 vehicles, we found that the tailpipe CO2 reduction achieved, compared to petrol when using these modern LPG systems varied between vehicles and systems but was in the range of 7 percent to 15 percent.

To put this in perspective, the environmental benefits possible from Australia's current LPG fleet, of 511,535 vehicles (according to the February 2011 ABS vehicle census), and making calculations using Australia's actual LPG fuel consumption and the Government's National Greenhouse Accounts Factors – LPG vehicles reduce greenhouse gas emissions, including CO2, by more than 460,000 tonnes per year due to the petrol that they displace.

As more LPG vehicles move to the modern style systems, the CO2 benefit of the fleet will continue to improve. Yet, if the carbon tax were to be applied to transport fuels, the price differential of petrol to LPG would be less than

one cent per litre – not enough to entice consumers to convert to this lower carbon fuel when there is a substantially greater price differential between fuel stations and on different days of the week.

### Biggest challenge

Automotive LPG system technology has come a long way in recent years, but the greatest challenge in ensuring the continued use of the fuel in Australia appears to be future Government endorsement to support its use. With carefully balanced policies in place, it is possible to achieve the objectives of energy security, enabling mobility and improving environmental outcomes – all from a fuel that is considered by some, to be a by-product.

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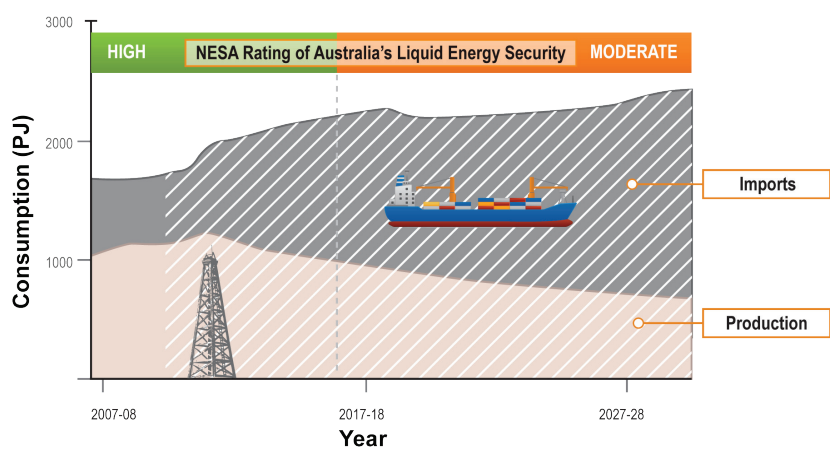
### Fast Facts from the ABMARC LPG Survey:

ABMARC conducted an LPG survey to understand consumer attitudes to, and their experience with LPG vehicles. Key results showed that LPG owners/operators:

- Are more likely to live in the outer suburbs than the inner city or rural areas and mostly drive large cars or SUVs
- Travel up to 30% more than the typical Australian driver
- Typically had a positive experience with LPG, rating it 8.6 out of 10, with only 7% believing an LPG powered vehicle was less reliable than a petrol only car
- 5% complained about a lack of LPG availability (particularly in rural areas) and only 3% had encountered a hard to fill problem whilst refuelling
- On average, LPG vehicle users had a lower weekly income and use LPG to assist in meeting the weekly household budget. In fact, 72% of respondents believed that if they had to use petrol, they could not afford to operate their vehicle or would have to reduce their vehicle use and activities.

From our analysis of the results, we found that LPG powered vehicles enable mobility to many groups of people - from families to retirees and the disadvantaged.

### Australia's Oil & Liquid Energy Security Forecast



Source: ABMARC Based on Abare data & the draft Energy White Paper (2011)