YOUR COMPETITIVE ADVANTAGE
Energy efficiency solutions for
Australian transport and logistics SMEs

SUPPLY CHAIN & LOGISTICS ASSOCIATION OF AUSTRALIA

Fact sheet no.4
Alternative fuels in freight and logistics

This fact sheet provides basic information about alternative fuel options for freight vehicles.

It is one of six fact sheets and other resource material developed by the Supply Chain and Logistics Association of Australia (SCLAA) and its project partners to help SMEs in the supply chain and logistics sector with energy efficiency improvements energy and cost reductions.

The full suite of resources is available from http://energy-efficiency.sclaa.com.au

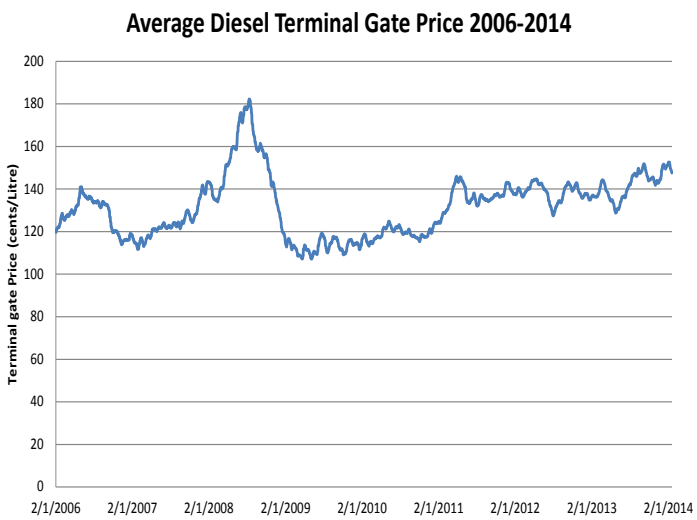
➤ Why the need for alternative fuels?

For many companies in the supply chain and logistics sector, the cost of fuel is their biggest operating cost. So it is not unexpected that operators would seek to reduce costs by looking for alternatives. The main reasons for a switch away from diesel are:

- High fuel costs: The long-term trend in diesel prices (and most projections for oil price) show a steady increase over time (see Figure 1).
- Fuel price volatility: Substantial fluctuation in fuel costs on a daily, weekly and monthly basis (also seen in Figure 1) makes business planning difficult.
- High environmental costs/emissions of diesel (relative to alternatives).

In short, an alternative that solves any of the issues above can provide you with a competitive advantage.

Figure 1: Historical increase in diesel prices (TGP)



➤ What are the alternatives?

The future promises operators many options to power their fleets: biofuels, synthetic fuels from coal/gas/shale, Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG), hydrogen, and electricity. Yet, for a SME today, the options are more limited. Only some are commercially available, and fewer still available widely: biodiesel, ethanol, natural gas, and LPG.

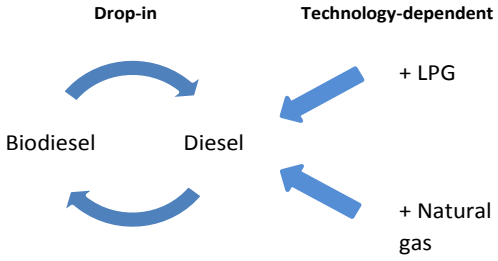
➤ Horses for courses

Fact sheet 1 highlights the importance of fleet profile in evaluating opportunities. Alternative fuels are the perfect example of why this is important.

Different engine designs and duty cycles mean that a fuel suitable for one truck may not be operationally or financially viable for another truck.

A major differentiator is whether the fuel replaces diesel or petrol directly without engine modification (drop-in), or if it requires additional engine technology (technology-dependent).

Figure 2: Difference between drop-in and technology dependent fuels



Biodiesel is a direct diesel substitute made from the fatty acids of biological material (plant or animal). It can be used at high rates of substitution (or pure) without major engine modifications. But it is usually blended with diesel in a ratio of 5% (B5) or 20% (B20), though some fleets have used 50% or 100% biodiesel.

Availability can be an issue, as few service stations stock it as a regular product (it is usually supplied in bulk, via a long-term supply contract, and stored on-site by the customer).

However, the main concern for SMEs is cost: some feedstock prices fluctuate nearly as much as oil, leading to high or unstable biodiesel prices. However, some operators have managed to secure reliable supply at good prices.

Ethanol is to petrol as biodiesel is to diesel. Most regular unleaded petrol in the eastern states is blended with a small proportion of ethanol (E5 or E10), but up to 85% (E85) is available.

However, because it substitutes for petrol, and because most heavy vehicles operate on diesel, ethanol is mostly limited to light commercial vehicles.

LPG is a direct petrol substitute used in spark-ignited engines without significant modifications to the engine (though the fuel system will need replacing).

For this reason, it is more suitable for the light vehicle fleet (vans and utilities). But it can also be used in a compression-ignition engine to substitute for diesel, though only at low levels of substitution.

Natural gas has attracted significant interest in recent times as an alternative fuel for trucks. Its technical suitability is well understood and demonstrated in thousands of buses across the country.

Like LPG, it can be used to substitute for both petrol and diesel, but can only be used in pure form in a spark-ignited engine (with the associated efficiency penalty of that engine design).

Unlike LPG and biofuels, the cost of engine and fuel system modifications are significant for natural gas. A major contributor to this is the cost of fuel tanks: high-pressure vessels for compressed gas (CNG); or double-walled cryogenic tanks for liquefied gas (LNG) at minus 163 °C.

On-board storage becomes the primary consideration because the cheaper tanks for CNG reduce the vehicle's driving range (LNG has three times higher energy density than CNG). As a result, CNG is more often used on vehicles that return to base, and LNG on linehaul operations.

There are a range of LNG suppliers to the road freight transport sector in Australia, including BOC, Shell and Evol LNG.

➤ The business case for alternative fuels

Alternative fuels are not strictly a pathway to improved energy efficiency – without other changes, a truck uses the same (or more) energy as it would with diesel, to do the same amount of work.

But a fuel switch can be an effective way to reduce operating costs because a lower cost of the fuel ($ per diesel litre equivalent) means an operator can find significant fuel savings if it suits the truck and operation.

Table 1 shows a range of estimated payback scenarios for two different LNG engine technologies (dual-fuel and High Pressure Direct Injection) in a typical linehaul operation.

Variation in the payback period (with green indicating good and red bad) for a range of mileage and fuel consumption demonstrates the sensitivity of the business case.

Table 1: Payback sensitivity of LNG vehicle based on changes in fuel burn and mileage @ 50cpl

Vehicle technology	High Pressure Direct Injection			Dual-fuel		
Fuel burn (km/L)	1.6	1.8	2	1.6	1.8	2
150,000 km p.a.	2.4	2.7	3.1	2.0	2.3	2.6
200,000 km p.a.	1.8	2.0	2.3	1.5	1.7	1.9
250,000 km p.a.	1.4	1.6	1.8	1.2	1.4	1.6
300,000 km p.a.	1.2	1.4	1.5	1.0	1.2	1.3

In this case, as mileage (and/or fuel consumption) rises, the business case becomes more convincing. This shows that savings increase as more gas replaces diesel. While this is a valid general principle, the actual payback figures represent a particular operation at a specific point in time, which may not apply in your case.

Before committing to a particular fuel, you should have your fleet analysed for its financial and operational suitability.

➤ More information

Green Truck Partnership

Trials of fuel-efficient technology under the Green Truck Partnership

www.rms.nsw.gov.au/heavyvehicles/greentruck/

Gas Energy Australia

Gas Energy Australia is the national peak body which 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).

http://gasenergyaustralia.asn.au/

Biofuels Association Australia

The Biofuels Association of Australia has been formed for the purpose of providing leadership as the peak representative body facilitating the building of a sustainable, economically viable Australian biofuels industry, consistent with national and community interests and environmental standards.

http://www.biofuelsassociation.com.au

The following are private sites. SLCAA does not endorse these sites but is supplying the links for user reference only.

Isuzu

Manufacturers making factory-backed (warranted) natural gas vehicles that are available in Australia

http://www.isuzu.com.au/truck-range/cng-models.aspx

Kenworth

Manufacturers making factory-backed (warranted) natural gas vehicles that are available in Australia

http://www.kenworth.com.au/model-range/liquefied-natural-gas/

Mercedes

Manufacturers making factory-backed (warranted) natural gas vehicles that are available in Australia

http://www.mercedes-benz.com.au/content/australia/mpc/mpc_australia__website/en/home_mpc/van/home/new_vans/models/sprinter_906/sprinter_ngt.html

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