FleetWise Knowledge Pool

Vehicle Procurement

www.transport.vic.gov.au

State Government Victoria

Authorised by the Victorian Government, 121 Exhibition St, Melbourne Victoria 3000.

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Contents

This document outlines the role that vehicle procurement can play in reducing fleet emissions. It describes and assesses a range of existing and emerging vehicle and fuel technologies.

Improving vehicle procurement can make a major difference to both fleet emissions and costs. It can directly affect fuel consumption, total greenhouse gas emissions, and the emissions of other air pollutants. For example, improving vehicle procurement can reduce average fuel consumption (and greenhouse gas emissions) by up to 35%.

The topics covered here are:

1. Strategic reasons to reduce fleet emissions
2. Actions to reduce fleet emissions, including options for switching to vehicles with lower average fuel consumption such as vehicle down-sizing, using fuel-saving technologies and switching to alternative vehicle and fuel technologies
3. Organisational considerations, including strategies for overcoming possible resistance to using more efficient vehicles
4. Further information, including resources with information about switching to low-emission fleet vehicles, such as the Australasian New Car Assessment Program (ANCAP), the Green Vehicle Guide, and research papers on alternative vehicles and fuels.

1. Strategic reasons to reduce fleet emissions

Four strategic factors are pushing many organisations to alter their traditional fleet purchasing practices:

Increasing concern about climate change

There is unprecedented public concern about the problems associated with human-induced climate change. All levels of government have implemented legislation, policies and programs to reduce greenhouse gas emissions, and as concerns about climate change increase and climate science improves, more government action is likely.

The Australian Government has proposed a fixed price on carbon (Carbon Price Mechanism) to be introduced in 2012 with the potential to evolve into an Emissions Trading Scheme (ETS) in 2015/2016. The proposed Carbon Price Mechanism will place a price on carbon emissions across many sectors, particularly energy-intensive electricity generation and trade-exposed industries. Emission reduction measures such as a Carbon Tax will ultimately involve a major structural change to the Australian economy. For more information about government measures to reduce greenhouse gas emissions see *FleetWise Knowledge Pool: Environmental Legislation and Policy*.

Climate change also has major implications for business. Environmental reporting is now common as businesses try to make their operations more sustainable in response to the concerns of staff, customers and shareholders. Improving 'climate competitiveness' is emerging as a key business challenge – organisations are increasingly changing their practices to reduce their potential carbon liabilities and position themselves to cater for the demands of increasingly climate-conscious markets.

Government actions to reduce average fuel consumption

The Australian Government and State and Territory governments have implemented a range of policies to reduce the average fuel consumption of the Australian vehicle fleet. The main initiatives that are relevant to passenger fleet vehicles are:

- **Work being conducted by the inter-governmental Vehicle Fuel Efficiency Working Group**
  In 2008 this Working Group released a paper outlining a range of potential actions to improve the fuel efficiency of the Australian transport sector. In 2009 the same paper was re-evaluated and updated based on the Working Group's assessment of the effectiveness of measures originally outlined in an international and local context and comments from key stakeholder organisations.

  More details can be found at **www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/vehicle_fuel_efficiency_working_group_final_report.pdf**

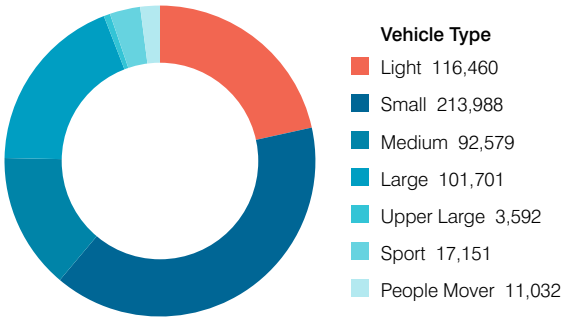
  Recommendations highlighted in the paper include:

  - Set carbon dioxide (CO2) emission targets for new light vehicles (voluntary or mandatory).
  - Differentiate registration and stamp duty charges for new light vehicles, based on environmental performance.
  - Develop online information resources to disseminate best practice.
  - Work towards developing a code of practice for the inclusion of fuel consumption and CO2 data in vehicle advertisements and promotional materials.
  - Develop and implement international standards for non-engine components impacting on vehicle fuel efficiency.
  - Develop online resources detailing trials and evaluations of low emission technology for commercial vehicles.
  - Direct financial incentives to encourage the purchase of low-emission vehicles.

  Some of these actions are underway and others are in development. Combined they signal an on-going commitment to reducing transport emissions. This is likely to have future implications for fleet operators.

- **The Australian Government's $1.3 billion Green Car Innovation Fund**
  The fund commenced in July 2009 and provided grants to organisations in the areas of research and development, and early-stage commercialisation of technologies that significantly reduce fuel consumption and greenhouse gas emissions from passenger vehicles. Due to cost saving measures generated as a result of the 2010 eastern Australian floods the Green Car Innovation Fund was closed in January 2011. A number of positive projects resulted from the fund however, including the hybrid Camry, diesel/LPG Ford Falcon, and local production of the Holden Cruze. The Government has committed to honouring all contractual commitments and grant offers made through the Fund before January 2011. More information is available at **www.ausindustry.gov.au/Manufacturing/GreenCarInnovationFund/Pages/GreenCarInnovationFund(GCIF).aspx.**

Figure 1
Sales in the new vehicle market, 2009
Source: Federal Chamber of Automotive Industries 2009



The Australian used-vehicle market and implications for future vehicle selection

In recent years the ongoing volatility in global oil prices and increasing availability of relatively affordable, small and mid-sized imported vehicles have combined to lower the residual value of many larger vehicles. As a consequence, switching to smaller vehicles makes it possible to reduce fleet emissions without a significant increase in fleet costs. Smaller vehicles often have higher proportional residual values and lower average fuel consumption, which can make their purchase a wise financial decision. For more information see www.moneybuddy.com.au/car-loans/best-resale-value-cars.html.

Small vehicles are now the highest selling category of passenger vehicles, as can be seen in Figure 1.

The outlook for fuel prices

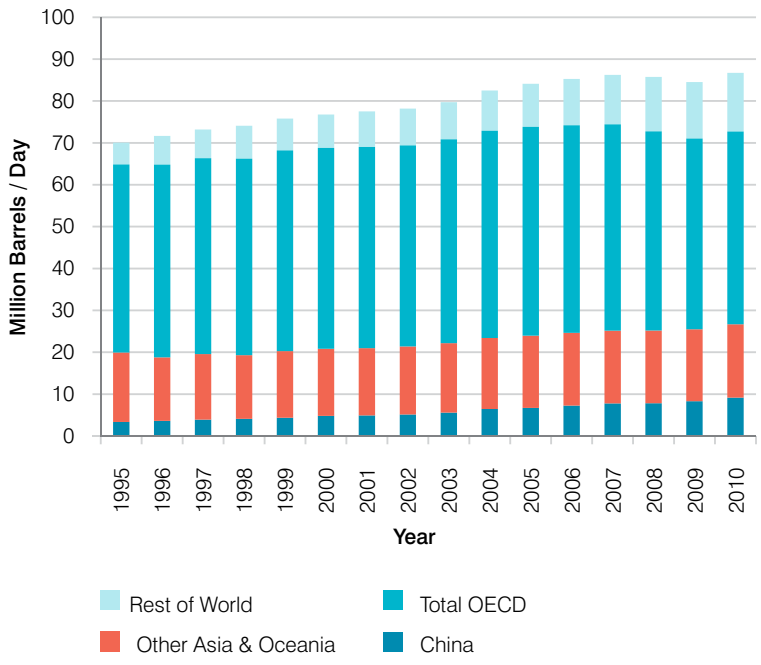
Transport fuels in Australia have been subject to unprecedented levels of price fluctuations in recent years, with retail petrol prices rising from an average of $0.95 per litre in 2005 to a national average price of more than $1.80 per litre in mid-2008. In the 12-month period ending May 2011, the national average petrol pump price increased 12% from $1.29 to $1.45.

While an analysis of global oil prices over the past decade shows sustained increases, there are differing forecasts about their future direction. There are two prevailing schools of thought about the global oil price outlook:

- **The demand-side perspective,** which suggests that increasing global fuel prices are being driven by increased global demand, particularly from the emerging economies of India and China (see Figure 2). Advocates of this view, point to declining global oil prices in late 2008 to early 2009 – which coincides with a global economic slowdown. If the demand-side perspective is correct, the longer term projection for oil prices is likely to be upward, particularly as the global economy recovers from the current slowdown.
- **The supply-side perspective,** which suggests that increases in global fuel prices are being driven by volatile supplies of cheap oil. Analysis of changes in excess oil capacity, for instance, revealed a marked decline from 7 million barrels per day in July 2002 to less than 1.5 million barrels per day in April 2005, increasing to 2.5 million barrels per day in January 2007, and again falling to 1.5 million barrels per day. Analysis also highlights a dramatic decline in oil discovery rates since 1980 (Campbell, 2002, in http://greatchange.org/ov-campbell,outlook.html). However, this perspective is contested by some because predicted peaks in global oil supply have so far not occurred.

As a result there is significant uncertainty about the future direction of retail oil prices. In light of this uncertainty and the historical upward trend in global oil prices, improving the average fuel consumption of a fleet appears to be a sound risk management policy.

Figure 2
Observed increase in global oil demand (1995–2010)
Source: Based on data from the International Energy Agency



2. Actions to reduce fleet emissions

Vehicle down-sizing/right-sizing

Historically, the default fleet vehicle purchases were large 6-cylinder vehicles. Despite using more fuel, these vehicles represented good value for money and the higher residual value of these larger vehicles provided them with better financial returns than smaller vehicles, when considered on a life-cycle basis. However, as discussed earlier, the residual value of many large vehicles has fallen recently due to a combination of higher oil prices and the availability of cheaper small and mid-sized vehicles. As a result, choosing smaller vehicles increasingly provides an opportunity to reduce fleet emissions with limited financial consequences.

Table 1 (next page) lists options for decreasing both average fuel consumption and greenhouse gas (GHG) emissions by switching to smaller vehicles.

Further information and references for Table 1

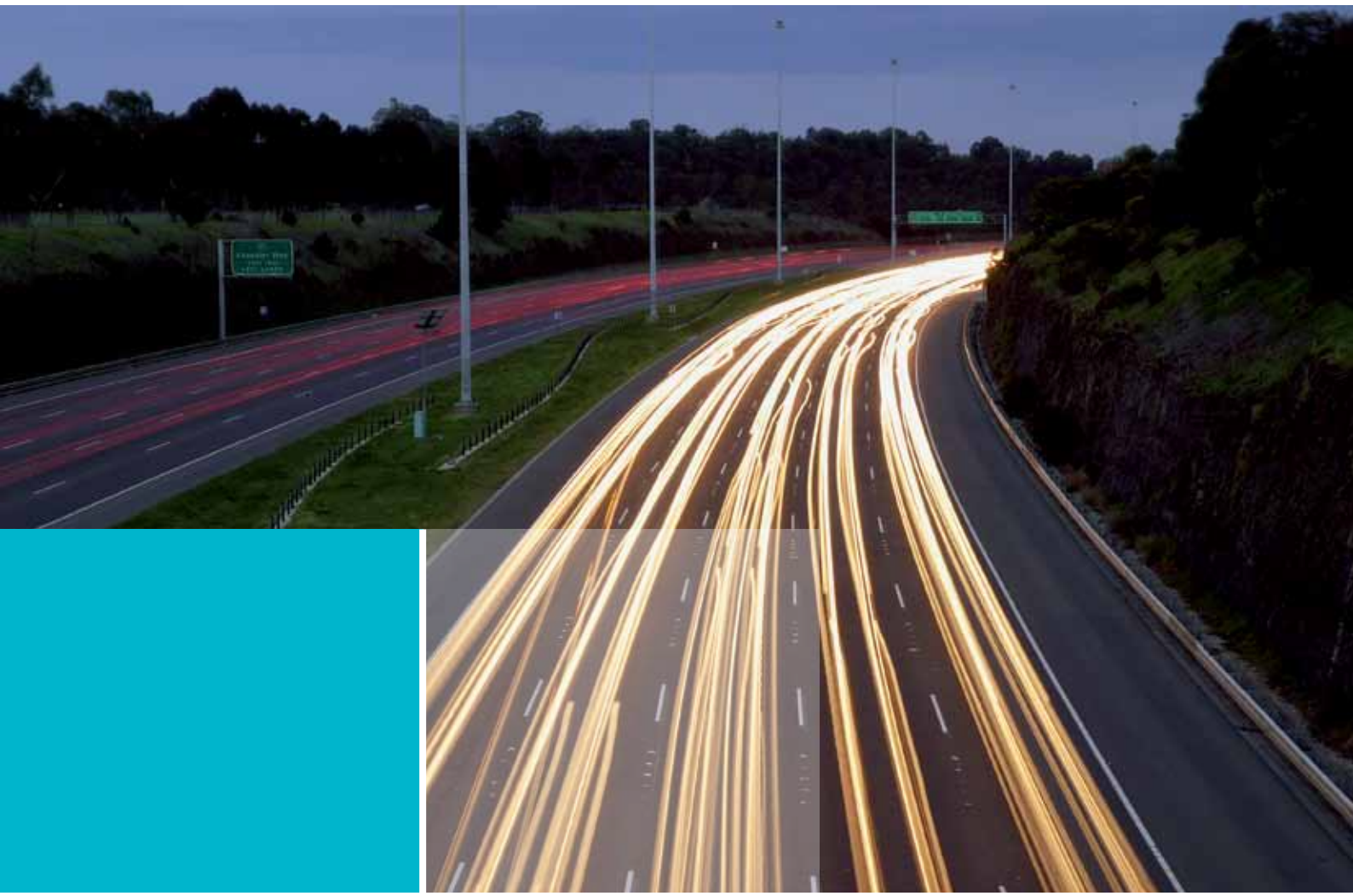
Australasian New Car Assessment Program
www.ancap.com.au

Green Vehicle Guide
www.greenvehicleguide.gov.au

The King Review of low-carbon cars, UK 2007
www.hm-treasury.gov.uk/king_review_index.htm

Table 1
Vehicle down-sizing/right-sizing

Action	Improvement rationale	Environmental outcomes	Financial	Other
Replace 8-cylinder vehicles with 6-cylinder vehicles.	Replacing 8-cylinder vehicles with 6-cylinder vehicles can contribute to a reduction in average annual fuel consumption, which in turn can reduce greenhouse gas (GHG) emissions.	Potential GHG emission reductions can be around 25%. Green Vehicle Guide Air Quality Scores can improve 40%.	Annual fuel savings can be around 25%. Whole-of-life savings can be around 10–15% (based on recent analysis suggesting the residual value of an 8-cylinder vehicle is only marginally higher than that of a large 6-cylinder sedan).	This action can be implemented without the adverse employee relations and human resources issues associated with vehicle down-sizing. 6-cylinder vehicles typically have similar safety ratings compared to 8-cylinder vehicles.
Replace large 6-cylinder vehicles with smaller 6-cylinder vehicles.	A move away from the large 6-cylinder vehicles (e.g. 3.6 and 4.0 litre) to smaller 6-cylinder vehicles (e.g. 3.0 litres) can deliver a modest but significant reduction in annual fuel consumption and related GHG emissions.	Potential GHG emission reductions can be around 15%. No significant changes in Green Vehicle Guide Air Quality Scores are likely.	Annual fuel savings can be around 15%. Whole-of-life savings can be around 5–10% (based on recent analysis suggesting the residual value of a smaller 6-cylinder vehicle is slightly higher than that of a large 6-cylinder sedan, largely negating the slightly higher purchase price in many cases.)	This action can typically be implemented without the adverse employee relations and human resources issues associated with some vehicle down-sizing actions. ANCAP safety ratings suggest the majority of smaller 6-cylinder vehicles provide comparative levels of occupant safety to larger 6-cylinder vehicles.
Replace 6-cylinder vehicles with 4-cylinder vehicles.	Replacing 6-cylinder vehicles with 4-cylinder vehicles can deliver lower annual fuel consumption with associated proportional reductions in GHG emissions.	Potential GHG emission reductions can be around 25%. Green Vehicle Guide Air Quality Scores can improve 20%.	Annual fuel savings can be around 25%. Whole-of-life savings can be around 15% (based on recent trends in average used-car prices suggesting that the historically lower re-sale values of smaller vehicles may have been reversed with increased market demand for more fuel-efficient vehicles)	Employees may resist this action because of concerns about occupant safety and/or small cabin size (particularly in the case of salary packaged vehicles). ANCAP safety rating results highlight the capacity of low fuel consumption cars to achieve the highest safety ratings of up to 5 stars, delivering similar levels of occupant safety to larger vehicles. This means careful vehicle selection can be used to overcome these concerns. Innovative salary packaging strategies can be used to create economic incentives that negate other forms of employee resistance.



Adopting fuel efficient vehicle technologies

While much focus is directed on the potential for deriving environmental improvements from alternative vehicle fuels and drivetrains, there are new conventionally powered vehicles equipped with fuel efficient technologies that can also offer environmental benefits. Care should be taken in choosing technologies because there are many competing (and often conflicting) claims about potential improvements in fuel efficiency.

Table 2 (next page) lists options for decreasing average fuel consumption and GHG emissions by adopting more fuel-efficient vehicle technologies.

Further information and references for Table 2

Australasian New Car Assessment Program
www.ancap.com.au

autoblog green
www.autobloggreen.com/tag/turbocharger/

Diesel Technology Forum
www.dieselforum.org/multimedia/glossary/piezo-common-rail-direct-injection-system

Green Vehicle Guide
www.greenvehicleguide.gov.au

Mazda Australia
'Mazda launches highly-efficient SKYACTIV-G 1.3 litre petrol engine'
www.mazda.com.au/Community/News/2011/5/Mazda%20launches%20highly%20efficient%20SKYACTIV%20G%2013%20litre%20petrol%20engine.aspx

The King Review of low-carbon cars, UK 2007
www.hm-treasury.gov.uk/king_review_index.htm

SAAB Australia
www.saabs.com.au/saab-articles/saab-turbo-x-touches-down-in-australia

Table 2
Fuel-efficient vehicle technologies

Action	Improvement rationale	Environmental outcomes	Financial outcomes	Other considerations
Replace conventional petrol vehicles with direct injection (DI) vehicles.	DI technologies can significantly reduce average fuel consumption relative to conventional engine equivalent vehicles. While these vehicles are generally slightly more expensive to purchase, they can deliver annual fuel savings and reduced GHG emissions. Care needs to be taken to ensure these vehicles are equipped with particulate treatment systems to avoid an increase in particulate emissions.	Potential GHG emission reductions can be around 15% relative to conventional engine equivalent. Green Vehicle Guide Air Quality Scores can be downgraded unless the vehicle chosen is equipped with particulate treatment systems (i.e. particulate traps).	DI vehicles tend to be slightly more expensive to purchase than conventional engine equivalent vehicles. Although fuel economy is improved, in recent years the net annual fuel savings have been smaller than expected due to the significantly higher cost of diesel relative to petrol. Whole-of-life costs for this option are likely to be equivalent to (or marginally higher) than costs for conventional petrol vehicles.	Other than some uncertainty about whole-of-life costs, there appear to be no significant drawbacks associated with adopting this technology. DI vehicles tend to have occupant safety levels that are equivalent to that of similar-sized conventional engine equivalent vehicles. In 2011 Mazda released its new 'SkyActiv' direct injection petrol engine and transmission technology claiming 3.3L/100km to rival DI technology. The technology is expected to be made available in Australia mid-2012.
Replace 6-cylinder vehicles with smaller engine turbocharged or supercharged vehicles.	Turbochargers or superchargers can be used to help solve the dilemma of power versus fuel consumption. Turbochargers are powered by the energy of the exhaust gases that would otherwise be wasted, enabling engine downsizing typically to around 70% of the capacity of a normally aspirated one with the same power output. Using turbocharger technology can reduce fuel usage by as much as 15%. Adopting these devices thereby allows the purchase of a smaller engine (and more fuel efficient vehicle) without any trade-off in vehicle power. The net fuel savings vary depending on vehicle usage patterns, but when compared with larger vehicles, these devices can deliver significant economic and environmental returns.	Potential GHG emission reductions can be around 10% compared to conventional-powered equivalents. No significant changes in Green Vehicle Guide Air Quality Scores are likely.	These technologies tend to be targeted at the higher end of the vehicle market (although there is some evidence they may become a mainstream option in future), resulting in a higher capital cost when compared with other conventional petrol vehicles. Depending upon the make and model, there is not much difference in whole-of-life costs compared to conventional-powered vehicles.	The most significant issue affecting the adoption of this technology is the limited choice of turbocharged and supercharged vehicles available in Australia. The market is however starting to see an increase in the availability of small to medium-sized manufacturer-equipped vehicles offered by European manufacturers (e.g. Volkswagen, Citroen and Saab) and Japanese manufacturers (e.g. Subaru). Holden and Ford have also introduced this technology on their 4 and 5 cylinder vehicles (i.e. Holden Mondeo and Ford XR5). continued/
Replace conventional petrol vehicles with vehicles using variable cylinder technology.	These systems allow individual engine cylinders to be shut down during periods of low power requirements (e.g. idling or stop-start travelling), thereby reducing fuel consumption.	Potential GHG emission reductions can be around 5–7% compared to conventional petrol vehicles. No significant changes in ***Green Vehicle Guide*** Air Quality Scores are likely.	Annual fuel savings can be around 5–7% with only a small incremental increase in new vehicle purchase price.	This technology is currently only available in a small number of vehicles (e.g. Honda, Holden).

Alternative fuels and drivetrains

There are a few alternative fuel or drivetrain vehicles available in Australia, with more likely to enter the market in the next few years. Care should be taken to assess the relative benefits of these alternative technologies and fuels on a whole-of-life basis (i.e. not just looking at post-combustion emissions).

Table 3 (next page) lists options for decreasing average fuel consumption and GHG emissions by adopting alternative fuel or drivetrain technologies.

Further information and references for Table 3

Australasian New Car Assessment Program
www.ancap.com.au

Australian Liquefied Petroleum Gas Association (2002), Liquefied Petroleum Gas as an automotive fuel – An environmental and technical perspective. Sydney 2002
www.cleanairnet.org/caiasia/1412/article-58767.html

Australian Liquefied Petroleum Gas Association (ALPGA) submission to the 2008 review of the Australian Automotive Industry, 2008 (listed as 'LPG Australia')
www.innovation.gov.au/automotivereview/Pages/submissionsreceived.aspx

ALPGA Industry Strategic Road Map – GHG Paper (2010)
http://lpgaustralia.com.au/site/library. php?task=detail&type=4&id=0053

Australian National University: 2001 LPG vehicle trial
www.anu.edu.au/anugreen/index.php?pid=231

The Australian Transport Council and the Environment Protection and Heritage Council Vehicle Fuel Efficiency Working Group discussion paper, Vehicle Fuel Efficiency: *Potential measures to encourage the uptake of more fuel efficient, low carbon emission vehicles*
www.environment.gov.au/settlements/transport/

Green Car Congress, 'Valeo Providing Stop-Start System for Mercedes A- and B-Class; Signs 1M+ Unit Deal with PSA'
www.greencarcongress.com/2008/07/valeo-providing.html

Green Vehicle Guide
www.greenvehicleguide.gov.au

Holden: LPG duel-fuel innovation
www.holden.co.nz/innovation/lpg.html

The King Review of low-carbon cars, UK 2007
www.hm-treasury.gov.uk/king_review_index.htm

MarketWatch: 'Incentive bonus, buying a hybrid car makes more economic sense today'
www.marketwatch.com/news/story/buying-hybrid-car-makes-more/story.aspx?guid=%7BC2BCF7C6-95F3-47A8-AB21-79E4271A42E7%7D

Natural Gas Vehicles (NGV) Australia, *Potential Measures to Encourage the Uptake of More Fuel Efficient, Low Carbon Emission Vehicles*
www.environment.gov.au/settlements/transport/publications/vfe-paper/submissions/46ngva.pdf

NRMA Jamison Group Report, A Roadmap for Alternative Fuels in Australia: Ending our Dependence on Oil
www.mynrma.com.au/cps/rde/xchg/mynrma/hs.xsl/jamison_report.htm

Organisation for Economic Co-operation and Development (OECD), 'Biofuel policies in OECD countries costly and ineffective, says report'
www.oecd.org/document/28/0,3343,en_2649_33717_41013916_1_1_1_1,00.html

US Department of Energy fuel economy website, engine technologies
www.fueleconomy.gov/Feg/tech_engine_more.shtm

Table 3
Alternative fuel and drivetrain technologies

Action	Improvement rationale	Environmental outcomes	Financial outcomes	Other considerations
Replace conventional petrol vehicles with hybrid electric vehicles.	Hybrid electric vehicles deliver power from the combination of an electric motor and a conventional internal combustion engine, with the 'switching' controlled by an on-board computer system to maximise energy efficiency. The average fuel consumption of these vehicles is typically 35% to 40% lower than that of an equivalent-powered conventional petrol vehicle.	Potential GHG emission reductions can be around 35–40% No significant changes in Green Vehicle Guide Air Quality Scores are likely.	The significant fuel cost savings can offset higher purchase prices – whole-of-life savings can be around 5%. Apart from the initial few years following their introduction, hybrid vehicles have maintained their value over time and tend to have a higher resale value than conventional petrol vehicles. An analysis of maintenance and repair prices also reveals that the cost of maintaining a hybrid vehicle is equivalent to that of a conventional vehicle.	There are some adverse pre-conceptions about the performance of these vehicles. The range of hybrid vehicles available in Australia is relatively limited (so employee choice is limited) and they are typically more expensive to purchase than equivalent-powered conventional petrol vehicles. The combined effect of these factors can result in some internal resistance to using hybrids. However, such resistance may be overcome by increasing staff awareness of their operational performance.
Replace conventional petrol vehicles with fully electric vehicles.	A fully electric vehicle is a vehicle driven by an electric motor powered by rechargeable, on-board batteries using electric motors and motor controllers instead of an internal combustion engine.	Potential GHG emission reductions can be up to 100%. Tailpipe emissions reductions are 100% compared to ULP, however the total emission reductions will vary depending on the type of energy sourced for the vehicle.	As a new technology product being manufactured in relatively small numbers, EVs are considerably more expensive than conventionally powered vehicles. Other cost factors that need to be considered are the cost of electricity (if not using GreenPower), the cost of recharging infrastructure, repair costs (in relation to a current lack of skilled EV mechanics), and taking all of these into consideration, thought needs to be given to resale value.	
Replace conventional petrol vehicles with dual-fuel LPG vehicles.	The carbon intensity of LPG is lower than that of petrol when considered on an energy equivalence basis. The part substitution of LPG for petrol can therefore deliver reduced GHG emissions. However, it is worth noting that in general, the GHG performance of dual-fuel LPG vehicles under Australian conditions has been found to be inferior to that found in Europe.	Potential GHG emission reductions can be around 5–7% compared to using petrol only. No significant changes in Green Vehicle Guide Air Quality Scores are likely.	Whole-of-life costs are typically the same as those of petrol vehicles. This is because the slightly higher capital costs to purchase these vehicles (relative to conventional petrol vehicles) can typically be recouped within one to two years of operation (assumes 60% LPG substitution). However, these fuel savings tend to be negated by slightly lower vehicle resale values than conventional petrol vehicles.	Several Australian manufacturers offer manufacturer-equipped dual-fuel LPG vehicles, but the range of available models is still relatively limited. These vehicles also need to be maintained regularly to prevent them running 'out of tune' and delivering sub-optimal economic and environmental outcomes. continued/

Table 3
Alternative fuel and drivetrain technologies

Action	Improvement rationale	Environmental outcomes	Financial outcomes	Other considerations
Replace conventional petrol vehicles with dedicated LPG vehicles.	The carbon intensity of liquefied petroleum gas (LPG) is lower than that of petrol when considered on an energy equivalence basis. Theoretical studies suggest a GHG emissions benefit as high as 20% in some cases. Usage in Australia reveals more modest results in the order of 10% given current technology, with the potential to increase to 13% for advanced LPG technologies and LPG sourced from natural gas fields (ALGPA 2010).	Potential GHG emission reductions can be up to 10–13%. No significant changes in ***Green Vehicle Guide*** Air Quality Scores are likely.	In spite of the significantly lower energy, switching to LPG can deliver a significant fuel cost saving compared to conventional petrol. However, whole-of-life costs average around 5% more than conventional petrol vehicles. This is because of a combination of the slightly higher capital cost to purchase these vehicles (relative to conventional petrol vehicles), and potentially lower vehicle resale values.	The range of dedicated LPG vehicles available in Australia is limited (so employee choice is limited). Their lower residual value relative to conventional petrol vehicles is also a source of some resistance within organisations.
Convert existing petrol vehicles to LPG operation (dual-fuel).	Fitting an after-market LPG kit can deliver improved emission outcomes, but the benefits are not guaranteed, with some systems delivering sub-optimal GHG outcomes when compared to conventional petrol vehicles.	Potential emission reductions are highly variable depending on the gas kit technology, with GHG emission reductions ranging from 0–3% (assumes 60% LPG substitution). Achieving these benefits depends on regular maintenance of the vehicle and gas system.	Although the emissions performance of after-market systems is typically inferior to manufacturer-installed systems, the financial outcomes of after-market dual-fuel systems are similar to that of manufacturer installations; i.e. these systems deliver neutral economic outcomes because recurrent fuel savings are generally offset by lower resale values.	The quality of the installation is a key determinant of the impact of an LPG conversion on average fuel consumption.
Convert existing petrol vehicles to CNG operation (dual-fuel).	Compressed natural gas (CNG) has a lower GHG intensity than petrol or LPG. Fitting an after-market system can reduce GHG emissions, but the magnitude of the improvement is determined by the sophistication (and typically the cost) of the gas system.	Potential GHG emission reductions can be around 5% (assumes 60% LPG substitution).	The small number of CNG cars in Australia makes it difficult to make reliable assessments of the economic outcomes of natural gas passenger cars in Australia.	The use of CNG cars in Australia is limited because there are few places for drivers to refuel.
Use ethanol (E10) instead of petrol.	Ethanol has a lower carbon intensity than conventional petrol, although the magnitude of the GHG reduction remains the subject of considerable debate. However, information supplied by the Australian Government suggests the use of ethanol can deliver a small GHG benefit. Ethanol blends of up to 10% can be substituted in most new vehicles without any discernible impact on engine wear.	Potential GHG emission reductions can be around 1–4% (assuming a 10% ethanol blend).	Using biofuels can deliver a slight financial advantage in terms of reduced annual fuel costs. However, ethanol has significantly lower energy content than regular petrol, which should be taken into account when comparing fuel costs.	The environmental value of ethanol is being debated. There is a considerable body of work being undertaken on second generation fuels (e.g. cellulosic ethanol), but these fuels are not expected to be available in significant volumes for a number of years. continued/

Table 3
Alternative fuel and drivetrain technologies

Action	Improvement rationale	Environmental outcomes	Financial outcomes	Other considerations
Use ethanol (E85) instead of petrol.	Ethanol blends of up to E85 can have significantly less GHG emissions than conventional ULP (potentially up to 187g CO2/km (0for E85 Molasses) depending on what feedstock is used.	Potential net GHG emission reductions can be above 15% depending on the feedstock used (assuming an 85% ethanol blend) (IEA 2007).	Most new vehicles in Australia are not compatible with ethanol blends above 10% (E10) with engine modifications required for those that aren't. Holden has E85 models available, however the overall range of manufacturers supplying E85 compatible vehicles is limited. Availability of E85 to the public is currently confined to only 31 refueling sites (at 31 December 2010) with 70 additional sites to be provided in 2011 (mainly in Victoria). There is also reluctance by some manufacturers to maintain vehicle warranty when higher blends of biofuels are used.	
Use biodiesel (B20) instead of mineral diesel.	Some forms of biodiesel can deliver lower GHG emissions than conventional diesel, but the size of the GHG benefit varies depending on the agricultural inputs used. Blends of up to 20% biodiesel can be used in some commercial vehicles, although most manufacturers specify a maximum blend of 5%.	Potential GHG emission reductions can be around 1% for low biodiesel blends compared to mineral diesel.	Using biodiesel can deliver a slight financial advantage in terms of reduced annual fuel costs due to the current fuel excise exemptions for biodiesel.	Biodiesel trials have delivered mixed results, with commercial vehicle operators concerned about fuel quality and constancy of fuel supplies.
Incorporate stop-start technologies with regenerative braking systems.	Sometimes referred to as idle-off systems, this technology turns the engine 'off' when the vehicle is standing still (such as at traffic lights). In most cases this technology must be designed and incorporated with the original equipment rather than after-market installation. Installing this technology can significantly improve average fuel consumption in urban situations.	Potential GHG emission reductions due to this technology can be around 7%. No significant changes in Green Vehicle Guide Air Quality Scores are likely.	Financial implications of using this technology are largely unknown because it is relatively new, but significant annual savings are expected without any adverse impact on maintenance costs or resale costs.	This technology is relatively new and was previously not available as a retrofit option. Mazda began testing their Mazda 3 with i-stop technology in late 2010 with the commercial release planned for 2011/12.
Install low rolling resistance tyres.	Some brands of tyres provide a reduced level of rolling resistance, thereby reducing average fuel consumption.	Potential GHG emission reductions can be around 2–4%.	Annual fuel savings can be around 2–4% due to using these tyres.	There is a perception that using these tyres slightly reduces vehicle safety due to reduced tyre/road grip. However, results of independent testing have failed to validate these concerns (see King Review 2007).

3. Organisational considerations

Successfully implementing a low-emission fleet strategy involves coming to terms with a range of vehicle and non-vehicle considerations, such as whole-of-life fleet costs, the relationship with other aspects of an organisation's environmental strategy, employee considerations, and vehicle safety. Vehicle procurement policies need to consider all of these factors.

Many organisations have developed strategies and goals that set directions for managing key environmental issues. However, there has been a tendency for company-wide environmental strategies to overlook the vehicle fleet's contributions to the organisation's total environmental footprint.

The greenhouse gas emissions from a vehicle fleet are generally a significant contributor to total company-wide emissions, suggesting that an organisation's fleet strategy should ideally be advanced within the context of broader environmental goals. Including fleet emissions in calculations of total company-wide emissions offers the following advantages:

- the emissions reduction burden can be shared across the whole organisation – it is likely to be easier to cut emissions from a number of sections of an organisation (e.g. fleet, buildings, air travel) than to concentrate on just one area.
- it allows the organisation to measure and reduce its potential transport-related carbon liabilities.
- Key organisational considerations for implementing a low-emission purchasing strategy for vehicle fleets are discussed below.

Whole-of-life costing

Reducing the average annual fuel consumption of a vehicle has the potential to reduce both fuel costs and vehicle emissions. However, changing vehicle procurement decisions can also have a significant impact on vehicle resale values (or residual lease values).

For a full understanding of fleet costs, it is important to assess vehicle costs on a whole-of-life basis. Such assessments consider the initial purchase price of the vehicle, average annual fuel costs, other operating costs (e.g. maintenance costs, registration, and insurances), and the disposal value of the vehicle.

Historically, larger vehicles have held their resale value better than smaller vehicles but this trend has changed in recent years with rising fuel prices and the entry of low-cost new vehicle imports into the Australian car market. As a consequence, traditional views about vehicle procurement may need to be reassessed.

Employee concerns and incentives

There is a common preconception that switching to low-emission vehicles will be resisted by employees concerned about reduced vehicle purchasing options (for salary-packaged vehicles), safety, status and usefulness for non-work purposes. Such preconceptions can cause progressive fleet procurement strategies to be abandoned on the basis they will create a risk for staff retention.

These concerns may present a problem for some organisations, but experience shows that organisations that have successfully implemented low-emission vehicle purchasing strategies have overcome staff concerns by developing creative financial and non-financial strategies. Ideally these strategies are developed with staff consultation early in the process, and joint actions being undertaken by both the fleet and human resources departments. In fact, developing a reputation as an environmentally responsible organisation may prove more beneficial for attracting and retaining staff than offering staff large vehicles with poor average fuel consumption.

Some organisations reward staff who choose vehicles with low average fuel consumption, opt out of purchasing a company car altogether or travel less by car. One such innovative scheme is outlined on page 16.

Case study: Davis Langdon, UK

- Davis Langdon is a global project and cost management consultancy. In addition to the organisation's carbon neutral goals, it has a company car policy which aims to influence the employee's choice of vehicles.
- The organisation has benchmarked the company-packaged vehicle choice list against government environmental ratings and provides incentives for drivers to opt for low-emission vehicles. Staff can receive cash incentives for choosing lower emission vehicles or the option of using the estimated fuel cost savings towards the purchase of more expensive models.
- Staff who choose vehicles with poor emission performance pay a financial penalty with the cash paid into the company's sustainability programs.

Source: UK Fleet Directory: **www.fleetdirectory.co.uk/fleet-news/index.php/2008/02/26/davis-langdon-leads-the-way-in-driving-through-sustainable-company-car-policies/**

Vehicle safety

Providing safe vehicles for employees is of major concern to all organisations. Down-sizing the vehicle fleet can create employee concerns about possible reductions in occupant safety. Many small to medium cars have been designed with tear-away components designed to absorb crash impact along with the installation of multiple airbags and intrusion bars in these vehicles. Under ANCAP's recently released Roadmap, seat belt reminders will also become mandatory for front seats for a 5-star rating from 2013.

Safety concerns can be managed by providing objective information about the level of occupant safety, and enabling people to compare the safety levels between vehicle makes and models. In Australia this information is available via the Australasian New Car Assessment Program (ANCAP). This program provides safety ratings for individual vehicles based on crash tests. The information can be readily sourced from the NRMA **(www.mynrma.com.au/cps/rde/xchg/mynrma/hs.xsl/ancap.htm).**

4. Further information

There are many useful information sources that can help with preparing a vehicle procurement strategy. Some of the key resources are listed below.

Vehicle selection policy

Australasian Fleet Managers Association
www.afma.net.au/

Green Vehicle Guide
www.greenvehicleguide.gov.au

Safety assessments

Australasian New Car Assessment Program
www.ancap.com.au/ and
www.mynrma.com.au/cps/rde/xchg/mynrma/hs.xsl/ancap.htm

Alternative fuel and vehicle technologies

The Australian Transport Council and the Environment Protection and Heritage Council Vehicle Fuel Efficiency Working Group discussion paper, *Vehicle Fuel Efficiency: Potential measures to encourage the uptake of more fuel efficient, low carbon emission vehicles*
www.environment.gov.au/settlements/transport/

International Energy Agency, Transport
www.iea.org/subjectqueries/keyresult.asp?KEYWORD_ID=4121

International Energy Agency, Quarterly Oil Product Demand: World, 2011
http://omrpublic.iea.org/world/wb_wodem.pdf

International Energy Agency, 2007
Biofuel Production
www.iea.org/techno/essentials2.pdf

The King Review of low-carbon cars, UK 2007
http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/king_review_index.htm

National Greenhouse Accounts Factors
www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-factors.aspx

NRMA Jamison Group Report, *A Roadmap for Alternative Fuels in Australia: Ending our Dependence on Oil*
www.mynrma.com.au/cps/rde/xchg/mynrma/hs.xsl/jamison_report.htm

Organisation for Economic Co-operation and Development (OECD) article, 'Biofuel policies in OECD countries costly and ineffective, says report'
www.oecd.org/document/28/0,3343,en_2649_33717_41013916_1_1_1_1,00.html

Innovations in vehicle packaging and fleet management

Davis Langdon sustainable fleet case study
www.fleetdirectory.co.uk/fleet-news/index.php/2008/02/26/davis-langdon-leads-the-way-in-driving-through-sustainable-company-car-policies/; www.davislangdon.com/Global/

Environmental Defense Fund USA
www.edf.org/page.cfm?tagid=1605

Greenfleet UK
www.greenfleet.net/content/view/423/8/

NHS Hospitals UK
www.innovations4healthcare.co.uk/wp-content/uploads/ 2010/02/EST-N-Lincs-and-Goole-case-study.pdf

Provecta UK
www.zenithprovecta.co.uk/site1/default.aspx

www.transport.vic.gov.au

State Government Victoria

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