PETER HART

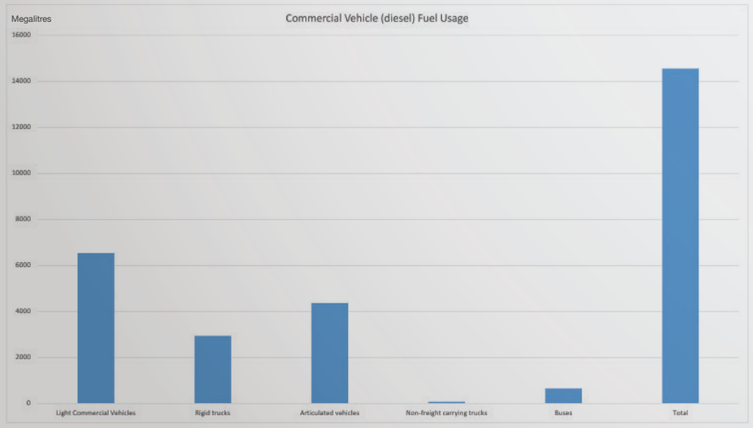
Can the road transport industry reduce CO_2 emissions?

I accept the urgent need for all of us to reduce our greenhouse emissions. I also accept that no industry will voluntarily change to its own detriment. Could the road freight industry reduce its emissions and be better off?

According to the latest Survey of Motor Vehicle Use issued by the Australian Bureau of Statistics, during the 12 months to 30 June 2020, the road transport industry moved 223,949 million tonne-kilometres of freight. In 2019 the BTRE predicted that freight growth in the road transport sector would grow on average by 2 per cent per annum. So, in 10 years' time — 2032, the freight task will be 124 per cent. That is, ~280 billion tonne-kilometers. While only 0.5 per cent of Australia's total vehicle fleet are articulated vehicles, 75per cent of the total tonne-kilometres were carried by them. Not surprisingly articulated vehicles had the highest fuel consumption at 53.1 litres /100km. In 2020 the freight carrying sector used 77 per cent of the 16.211 Megalitres of diesel consumed by road transport. That is, the freight carrying sector consumed 12.479 Megalitres of diesel fuel. This produced about 34 Megatonnes of CO2 per annum. There are about 750,000 commercial motor vehicles consuming that fuel. On average each vehicle consumes about 17,000 litres of diesel fuel per annum.

If the cost of diesel fuel is $1.20/l after subtracting taxes etc., then the fuel cost for the commercial vehicle sector in 2021 is about $B15. There are supply and political forces that could force the price of diesel fuel to increase above inflation levels. Government incentives intended to spur adoption of new technologies are likely to be paid for by reducing the excise rebate. I can easily envisage the cost of diesel rising by 5 per cent pa in real terms over the next decade. In 2032 a litre of diesel fuel could cost $2.00 excluding excise and GST. That is, $2.60 at the pump. It could be more. Rising fuel price is a significant risk that the industry should plan for.

The graph shows the fuel usage by commercial vehicles. The do-nothing scenario is that in 2032 the Australian road transport sector will use about 20 Megalitres of diesel fuel costing about $B32pa. This is a 124 per cent increase in diesel volume and an increase in fuel cost by 195 per cent. Is it possible to hold our fuel usage to 2021 levels? Probably yes. Here are my suggestions that could reduce the diesel fuel usage by commercial articulated vehicles. They fall into four classes, **Economy**, **Productivity**, **Coordination** and **Drive Technologies**:



ECONOMY

My estimates of the energy losses on articulated vehicles with diesel engines are shown in the pie chart. The potential fuel economy improvements are:

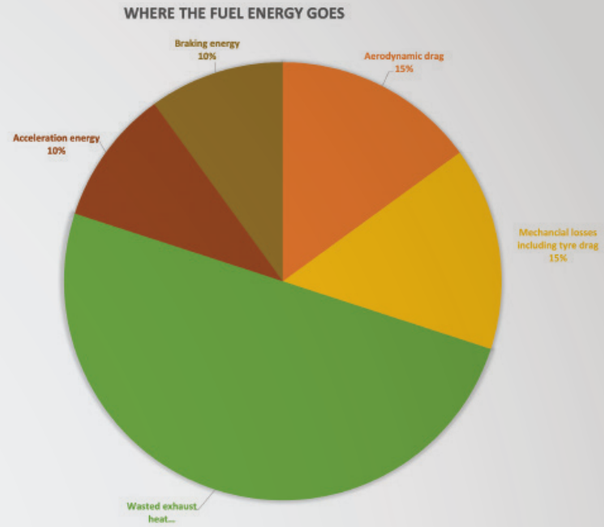
- Training drivers for fuel economy to reduce acceleration and braking energy. This has potential to improve fuel economy by ~ 5 per cent.
- Speed limiting trucks to 95km/h. This could reduce aerodynamic losses and acceleration energy. It probably has potential to improve fuel economy by ~ 5 per cent.
- Improving diesel engine efficiency significantly is not possible.
- Technical improvements might reduce tyre and aerodynamic losses by a couple of percent.
- In summary efficiency improvement of ~ 10 per cent are possible.

PRODUCTIVITY

The Australian road-freight sector has an impressive productivity improvement record. This is due to liberalised combination length and configuration rules. The widespread use of B-doubles and recently A-doubles on interstate routes and around freight hubs has doubled productivity in the past 30 years. More can be achieved; 30m long A- and B-double trucks should have access to most divided dual-carriageway highways. These trucks should be PBS accredited. However, regulators should define 'Blueprint' specifications that allow these configurations to travel without individual approvals being needed.

Mass limits should also be reviewed, as suggested by Chris Koniditsiotis in the ARTSA-I August 2021 article. I would speed limit 30m long vehicles to 95 km/h, which will deliver further fuel-usage improvement.

Such reforms should include fuel-economy, dimensional control, and mass management into a new nationally recognized accreditation scheme that could be called 'Productivity Accreditation'. I assess that fleets operating under Productivity Accreditation might achieve 10 per cent improvement in tonne-kilometre fuel economy over the next decade.



CO-ORDINATION

The USA Environment Protection Agency introduced the Smartway program about 20 years ago. It has helped industry to use less fuel. It does this by informing, connecting and awarding transport companies who improve fuel economy performance. Efforts to establish an Australian scheme based upon the USA Smartway model have been unsuccessful. It is vital that our industry fix this. An 'Australian Smartway' scheme is urgently needed to help our fleets:

- Identify and implement best practice fuel efficiency.
- Understand and manage the issues relating to new fuel-technology uptake.
- Promote arrangements whereby fleets share spare capacity to maximize tonne-kilometre freight performance.
- Assist multi-mode freight co-ordination.

DRIVE TECHNOLOGIES

The replacement rate per annum for single-trailer prime-movers is about is about 2 per cent and for multicombination prime-movers, about 4 per cent. At best 30 per cent of the motive vehicle fleet will be replaced over the next decade. It is unlikely that hydrogen powered trucks or battery electric trucks will be adopted in great numbers. While these technologies have merit, they are a long way from being proven performance for Australia's long-distance routes.

Hybrid trucks are being introduced for urban deliveries and they improve fuel economy by ~ 50 per cent. They have merit and should be incentivised.

On long haul trucks there is little prospect of hybrid drive technology having a significant impact in the next decade. Hybrid technology for prime movers is not currently on the radar. However, electric drives could be installed on heavy trailers. Heavy trailers have the space for a traction motor to be installed in front of the first axle. A battery pack, that might be easily changed over could be installed between the chassis rails. Electric traction on trailers would complement the diesel drive on the prime mover. The electric drive could be used to reduce the 'acceleration energy' and avoid gear shifting on the truck. It could also capture most of the 'braking energy'. Speed control braking on trailers is sensible considering road safety. An electric trailer might provide 20 per cent of the tractive effort. Thereby, the size of the truck diesel engine could be reduced improving fuel economy and lowering purchase price.

My concept of a hybrid semi-trailer involves a diesel powered prime mover with electric traction on the trailer. The trailer should qualify for higher mass limits. The trailer drive system could be controlled wirelessly from a portable control unit that is connected in the prime mover cabin to the OBD port. The trailer drive would be managed automatically in response to the prime-mover operating conditions, together with a driver override control. Australia uses more heavy trailers per truck than any other country. We could and should be world leaders with trailer electric drive technology.

Dr Peter Hart,
ARTSA

Summary of recommendations to make road transport more fuel efficient in 2032:

1. Introduce a *Productivity Accreditation* for fleets.
2. Allow 30m A- & B-doubles on most divided dual-carriageway roads.
3. Speed limit long combination trucks to 95 km/h.
4. Train and accredit drivers for economy driving.
5. Incentivise hybrid- and electric-drive rigid trucks.
6. Incentivise electric drives on semi-trailers to create 'hybrid' combinations.
7. Facilitate HML mass limits on trailers with electric drives.