TRUCK INDUSTRY COUNCIL
SAFER GREENER ESSENTIAL

TODAY'S TRUCKS

NATIONAL TRUCK PLAN

Modernising the Australian Truck Fleet

Truck Industry Council Members

Contents

Executive Summary

Compared to most modern global economies Australia has a very old truck fleet. An old truck has basic safety features and emits far greater amounts of exhaust emissions than current technologically advanced trucks. This has a direct and immediate impact on the Australia community.

The Truck Industry Council (TIC) is working with government (both federally and State by State) on a range of initiatives to modernise the Australia fleet. The immediate benefits in doing so will see a greater adoption of the latest safety technology, resulting in fewer crashes and fatalities; significantly improved environmental outcomes given the highest level of emission standards employed in today's trucks and the creation of pathways to Low and Zero emission vehicle take up.

To enable this, industry needs government help to provide incentives that encourage and enable the more rapid take up of modern equipment. These incentives include:

- Regulatory Incentives;
- Financial Incentives;
- Low Carbon Fuel Incentives; and
- Incentives to encourage behaviour change.

Trucks are essential to Australia's way of life, and underpin our economic well-being. TIC is committed to developing and enabling pathways to modernise the Australian Truck Fleet for the benefit of all Australians.

Today's Trucks: Safer Greener Essential.

Anthony J McMullan PhD
CEO

Introduction: The Aspiration of a Modern Australian Truck Fleet

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Australia, by world standards, has an old truck fleet with an average age of 14.8 years for trucks above 4.5t GVM.[1]

The primary aim of the Truck Industry Council's (TIC) 2025-2030 National Truck Plan is to advocate to Government the aspirational objective of modernising the Australian truck fleet.

In so doing, TIC's National Truck Plan acknowledges the Federal Government's key strategic objectives pertaining to Road Safety; Environmental (Decarbonisation and Reduced Noxious Emissions) and Economic Policy. In support of these strategic objectives, TIC presents recommendations the Government can pursue to deliver on those objectives. Recommendations presented in this plan cover:

- The reduction of fatalities and serious injuries involving heavy vehicles.
- Reducing heavy vehicle road transport carbon emissions and improving heavy vehicle energy productivity.
- Improving the health of Australians, particularly in urban areas, through a reduction in noxious emissions.
- Improving the efficiency and effectiveness of the nation's distribution channels, enabling the Federal Government's record road infrastructure spend to be realised.

To enable these benefits to become a reality today and for future generations, truck manufacturers and importers face implementation challenges that Government can solve for the betterment of Australian society. These barriers reduce the country's ability to modernise the nation's truck fleet and must be addressed by Government.

Truck manufacturers and importers are committed to working cooperatively with Government advocating for policy and regulatory development that will contribute to achieving positive outcomes for Australian society. TIC members are today supplying to market over ninety-nine (99) percent of all new on-highway trucks above 4.5 tonne Gross Vehicle Mass (GVM). Truck Manufacturers are providing operators with the latest technologically advanced low and zero emission truck models. As of early 2025, 10 brands offer battery electric trucks with another brand offering diesel/hybrid electric trucks. TIC members will continue to roll out more, new low and zero truck models this year and beyond. The key message is that the transition to a low carbon road freight future in Australia has well and truly begun.

This transition will also bring additional benefits:

- New low/zero emission vehicles and Euro VI diesel-powered heavy vehicles, are fitted with the latest safety technologies. This will drive down road trauma in road crashes involving heavy vehicles;
- Additional health outcomes for all Australians through emission reductions in particulate matter (PM) and nitrous oxides (NOx) for diesel powered truck that comply with Euro VI requirements; and
- Euro VI compliant trucks are engineered with advanced fuel saving technologies reducing fuel consumption (3 to 7 percent).

[1] BITRE Motor Vehicle Census 2023.

Introduction: The Aspiration of a Modern Australian Truck Fleet

> ***TIC calls upon Federal and State Governments to actively pursue an agenda which accelerates the adoption of the latest heavy vehicle safety systems, emission standards and advanced fuel saving technologies that will result in a safer, cleaner, greener and more energy efficient national truck fleet.***

These are all important attributes for the aspiration of a modern Australian truck fleet.

It is a well-known statement that without trucks Australia stops: never was this more evident than during COVID. The truck sector provides an essential service to society and the economy, adding to the nation's competitiveness within the global marketplace. The trucks sold by TIC members deliver our most basic needs; foodstuffs and medicine as examples, ensuring Australia's economy does not falter, maintaining our high standard of living. Our geography and decentralised population centres create a unique freight task, in which road transport plays the primary role. Excluding bulk commodities (e.g. minerals, resources), road transport constitutes 80% of Australian freight. Almost everything bought or sold in Australia has been on a truck at one time or another before it is in the hands of a consumer. This will not change to any significant level, because underpinning road freight's importance is the Australian consumer who when given the opportunity to choose delivery mode clicks the option that ensures the fastest delivery of their goods; this means a truck.

The choice is not whether Australia uses trucks – the truck is essential to our standard of living – the choice for the Australian people is whether we have the most modern fleet possible. The implications are profound: Australians can have safer, greener, cleaner and more productive trucks on the road, or we can continue with an old Australian truck fleet.

Government has a key role to play in promoting a more modern truck fleet, through appropriate policy settings that provide operational and financial incentives (and/or disincentives) for vehicle operators to upgrade their fleets. This will speed up the introduction of advanced truck safety, environmentally-friendly and intelligent transport and logistic technologies.

Australians want to be sure that the trucks on the nation's roads today comprise a modern truck fleet. Settling for less would be to agree that it is acceptable to go to a hospital and receive treatment from 15-year and older medical technology.

We would not settle for that and nor should we accept an old Australian truck fleet!

Chapter 1: About The Truck Industry Council

The Truck Industry Council (TIC) is the peak industry body and authorised advocacy voice representing manufacturers and distributors of heavy commercial vehicles (that is, with Gross Vehicle Mass above 3.5t) or 'trucks' in Australia.

Membership of TIC is inclusive of all truck manufacturers and importers/distributors in Australia and currently consists of eleven (11) truck manufacturers/distributors. TIC members are responsible for producing or importing and distributing eighteen (18) brands of truck for the Australian market. TIC membership also comprises four major component manufacturers who supply new carbon reducing engine and driveline systems for both on highway and off highway 'truck' applications.

The Australian new truck market is a $7 billion industry with ancillary activities estimated to have an economic value of a further $14 billion. For the past three years (2022, 2023, 2024) yearly sales have been 44,379 vehicles; 47,757 vehicles and 51,277 vehicles respectively.

> ***Even at these levels, the average age of the Australian truck fleet has not declined due to the ever-increasing freight task that requires more trucks. This is not an enviable position for Australia to find itself in.***

In 2025, the truck industry is designing, engineering, testing, developing and manufacturing trucks at two major locations in Australia without Federal Government assistance. The companies involved, and their locations, are:

- PACCAR Australia, manufacturing Kenworth and DAF brand trucks at Bayswater, Victoria;
- Volvo Group Australia, manufacturing Volvo and Mack brand trucks at Wacol, Queensland.

PACCAR and Volvo Group Australia combined produce approximately 50% of all heavy duty trucks sold in Australia.[2]

Complementing these Australian based truck manufacturers are truck importers who deliver the majority of new trucks sold in Australia, importing from Asia, Europe, and the United States of America.

In combination, TIC members provide trucks that meet the specific requirements of Australian operators who work in conditions unique to anywhere else in the world ensuring the efficient transportation of the nation's growing freight task.

A key feature of the Australian truck industry is that trucks sold require an additional second manufacturing step to fit the truck with the equipment required by the operator. At the point of first sale, the vehicle is not generally suitable for on-road use as in the vast majority of cases the truck is supplied as a cab chassis only. Ninety-five per cent of trucks sold require this secondary manufacturing process. As such, there are hundreds of second-stage manufacturing companies, from major trailer manufacturers, tipper and tanker builders to smaller companies making everything from specialist bodies, hydraulics for tippers and garbage collectors, cabins, fuel tanks, chassis frames, electrical harnesses, wheel guards and turntables.

Truck manufacturers and importers in Australia are major employers of skilled and semi-skilled people (trade, engineering, electronic and information technology) with a total workforce of approximately 40,000 in disciplines such as:

- Local truck manufacturing/assembly 4,800
- Importing and distribution of trucks 1,450
- Suppliers/dealers (sales, service and spare parts) 29.900
- Equipment and body builders (trailer, tanker, tippers and secondary manufacturers) 4,150

[2] TIC T-Mark Truck Market Sales Data 2024.

Chapter 2: The Challenge: Ambition meets Reality

1. Ambition: Australian Government Objectives

The Australian Government has identified key strategic objectives it wishes to pursue. TIC's National Truck Plan details initiatives that can be implemented to achieve this ambition.

Road Safety: The Australian Government has committed to the National Road Safety Strategy 2021-2030 with the aim of improving safety on our roads and putting the nation on a path to achieving Vision Zero, a target of zero road deaths and injury by 2050. Australian governments at all levels are working together with communities to change the road transport system to prevent deaths and serious injuries. This strategy details national goals, objectives and action priorities. Consideration of the policy initiatives detailed in the National Truck Plan will assist Government to achieve this road safety strategy, in particular, where the strategy relates to Safe Vehicles as part of the Safe System methodology.

Environment: The Australian Government ratified the Paris Agreement on Climate Change and the Doha Amendment to the Kyoto Protocol on the 10th November 2016. Upon winning the federal election, the Albanese Government immediately introduced and passed the 2022 Climate Change Bill enshrining into law an emissions reduction target of 43 per cent from 2005 levels by 2030 and net zero emissions by 2050. By this action, the Australian Government has committed itself to taking the necessary measures to secure a low carbon future. This is in addition to the Australian Government's desire to reduce harmful emissions, such as Particulate Matter pollution (PM) and Nitrogen Oxides (NOx). The measures outlined in the National Truck Plan support the Government's strategy and add to the policies Government can use to reduce domestic emissions from the heavy vehicle road transport sector.

National Energy Performance Strategy (NEPS): The Australian Government, in October 2022, announced that it will develop a National Energy Performance Strategy (NEPS) to create a high energy performance economy and deliver the energy efficiency savings required to meet the government's 2030 and 2050 emission reduction targets. NEPS will coordinate and accelerate actions that improve energy performance in homes, businesses, energy system planning and across the Australian economy. One of these actions is the development of a Net Zero Plan that will guide the nation's transition towards net zero greenhouse gas emissions by 2050. The Plan will cover all major parts of the economy. Six sectoral emissions reduction plans will support the Net Zero Plan. The transport sector is one of these plans and will detail an emissions reduction pathway.

Economy: The Australian Government seeks to build a strong economy through sustained growth and job generation. To achieve this objective, the Federal Government in its budgets has committed to record spending obligating itself to building and upgrading road infrastructure to improve freight productivity. Trucks are the enablers of this infrastructure; however, due to the high average age of the truck fleet, the efficiency and effectiveness benefits to be derived from modern infrastructure spending are not being fully realised. Australia has twenty-first century infrastructure and, in part, twentieth century trucks transporting freight inefficiently. Initiatives proposed in the National Truck Plan aim to bring about productivity gains maximising the Government's infrastructure spend.

2. Reality: The Problem Australia Faces in Achieving the Government's Ambition

The objectives of Government have been determined, reflecting the nation's ambition. Reality however presents a barrier to achieving this ambition. The problem Australia faces is the current age of the Australian truck fleet. By world standards Australia has an old truck fleet (refer to Figure 5.2 page 29).

The Australian truck fleet has an average age of approximately 14 years for all vehicles above 3.5t GVM and 14.8 years for trucks above 4.5t GVM.[3]

The key strategic objectives set by Government are not being achieved, in part, due to the inherent problem of the truck fleet's average age. Simply put, Australia has an old truck fleet. Reality determines a sobering statistic, that a new truck sold in 2025 will not be retired from the national truck fleet until 2055 based on current truck fleet profile.

An older truck fleet means that technological advances found in more modern trucks, such as safety, environmental and intelligent transport systems, are not being introduced into the Australian market in a timely manner. The result of which is the Australian Government's inability to meet its own strategic objectives.

3. Why is Australia's Truck Fleet So Old?

Understanding 'why Australia's truck fleet is so old' is key to modernising the nation's fleet. An old truck fleet cannot achieve the goals of enabling a cleaner, environmentally friendly, efficient and safer truck fleet that all Australians expect.

The reasons for Australia's ageing truck fleet include:

1. **Freight efficiencies and a company's 'bottom line' profitability.**

   New trucks are heavier than old trucks; typically, a post-2008 Euro IV diesel truck is 300kg to 600kg heavier than a pre-2003 Euro III truck (a post-2011 Euro V compliant truck is 300kg to 600kg heavier than a pre-2008 truck) due to the safety and environmental standards (ADR) that a new truck is required to meet. This weight penalty will become more acute for low and zero emission vehicles typically being one to two tonnes heavier than today's diesel truck. A newer truck cannot carry as much payload as an old truck making a new truck less productive and reducing the 'bottom line' profitability for the operator. Losses in this area cannot be offset from the increased profitability that is gained from the better fuel efficiency of a new truck. Some additional front axle mass allowance (500kgs) had been granted in 2008 in conjunction with the introduction of Euro IV and Front Underrun Protection System (FUPS) requirements. In conjunction with the implementation of ADR 80/04 from the first of November 2024 the States and Territories have permitted an additional floating 500kg for ADR 80/04 compliant trucks. However, typically a new ADR 80/04 truck continues to be less productive due to its increased TARE mass, as no mass concession was granted when Euro V was introduced in 2011. While, some states have granted extra mass concessions for zero emission vehicles, it is not of a quantum to offset the new technology employed on these trucks.

   The 'bottom line' profitability of an alternatively powered or low carbon emitting truck is substantially worse than that of an existing diesel powered truck. The additional weight due to batteries or hydrogen storage tanks further reduces the effective payload of these trucks, reducing energy productivity and coupled with a considerably higher initial purchase price, makes these vehicles commercially undesirable for an operator.

[3]BITRE Motor Vehicle Census 2023.

2. **Inefficient market dynamics – No second market exists for Australia's older trucks beyond Australian shores**

   In Western Europe older trucks are sold into Eastern Europe and Africa. In the USA and Canada older trucks are sold into South America, and Japan older trucks are sold in other less developed countries in the Asia-Pacific region. Australia has no viable retirement plan (alternative second market) for older trucks in effect, resulting in a market failure. The low scrap value for such vehicles is such that the operator finds it more economically viable to run trucks for much longer in Australia.

3. **'Fix it up, Keep it going' – The Australian Culture**

   A 'culture' for the continued replacement of old trucks and hence the updating of Australia's truck fleet simply does not exist in Australia. While the current culture of 'fix it up, keep it going' continues, the uptake of new more efficient diesel trucks and new low emission trucks will remain very poor. This current heavy vehicle purchasing 'culture', or 'buying behaviour', must be addressed by any fleet replacement incentive scheme introduced by the Australian Government.

4. **Poor uptake rate of new technologies (1% of total new truck sales)**

   TIC's data shows that for 2024, the share of LZETs in Australia's new truck market was 1.0% a significant improvement year-on-year; some 4.5 times higher than in 2022, with clear momentum behind both hybrid and BET sales.[4] The complete lack of incentives by Australian Governments for the uptake of low carbon emitting heavy vehicles is a major inhibitor to the uptake of such vehicles in this country.

The trucks sold into the Australian market today are by nature Safer, Greener and Cleaner than earlier model trucks. The next three chapters explores each of these aspects with the objective being to recommend to Government actions that can be taken to modernise the national truck fleet while assisting Government to achieve its own strategic objectives.

To overcome the inhibitors to Australia having a more modern truck fleet the Truck Industry Council calls upon the Federal Government to provide both incentives and disincentives to renew Australia's truck fleet.

[4]TIC T-Mark Truck Market Sales Data 2024.

Chapter 3: A Safer Australian Truck Fleet

Monash University Accident Research Centre (MUARC) first proposed the need for a 'safe systems' approach in order to stem road trauma at the Australasian Road Safety Conference, 14-16 October 2015. This recommendation came from a Victorian Government TAC funded research project into the contribution of vehicle safety improvements and infrastructure investment on reducing road trauma in Victoria.[5]

MUARCs 'safe systems' approach to road trauma was incorporated into the National Road Safety Action Plan 2015-2017.

This approach comprises:

- Improved road safety management;
- Safer roads;
- Safer road users;
- Improved post-crash response systems; and
- Safer vehicles.

TIC has a role to play in the fifth component to this system, that of 'safer vehicles'.

Given Australia has an old truck fleet, the question needs to be asked: 'Does Australia have the safest truck fleet possible?'

Put simply, the answer is 'No'. Our nation's truck fleet could be safer. The safety of trucks remains a major concern for the public and Government authorities.

Truck safety can be broadly categorised into four main areas:

1. Safety systems and technologies that prevent or reduce the likely incidence of crashes, or reduce the severity of a crash;
2. Vehicle types/combinations that prevent, or reduce the likely incidence of crashes;
3. Safety systems or technologies that prevent, reduce, or mitigate the likely effects of driver fatigue and/or distraction and inappropriate vehicle speed (and hence prevent, or reduce the likely incidence of crashes); and
4. Heavy vehicle roadworthiness (ensuring that a truck is maintained in a condition as recommended by the original equipment manufacturer, such that all systems operate as intended).

The age of the Australian truck fleet impacts on all four of these categories and thus reviewing these four safety categories against the age of a truck provides a clearer picture of the safety benefits of a younger Australian heavy vehicle fleet.

1. The effect that the age of the Australian truck fleet has on the uptake of heavy vehicle safety systems and technologies that prevent or reduce the likely incidence of crashes, or reduce the severity of a crash.

Anti-Lock Brake Systems (ABS), ADR 35/05, was mandated by the Australian Government from 1st November 2016. The ADR 35/05 Regulation Impact Statement (RIS) estimated that 1.9 lives per year could be saved with the fitment of ABS. ABS was offered by truck manufactures as standard fitment across most models from 2008 onward, some eight years before it was a mandated ADR requirement in Australia. Due to the early fitment of ABS to new trucks by TIC members, it is estimated that 95% percent of the Australian truck fleet will have ABS fitted before 2035, based on current uptake rates/fleet age. This is a considerably better outcome than if ABS had only been introduced by truck manufacturers when mandated by the ADR in late 2016.

If that had been the case, a 95% fitment rate would not be achieved until approximately 2045, some 10 years later.

This case clearly demonstrates the importance of early adoption of new safety technologies. This accelerated adoption of safety technologies cannot be achieved with Australia's current aged truck fleet, of some 15 years average age.

The above detailed case of a positive outcome for ABS adoption within the Australian truck fleet was brought about by truck manufacturers voluntarily bringing this technology to market prior to the government's mandate. The voluntary adoption of new technologies is very much dependent on the availability of the technology, the cost to bring the technology to market, and any negative impacts that technology may have. Such an impact may be additional tare mass, thus reducing effective payload and profitability for it's owner/operator. In the case of the ABS example, the technology was available having been introduced by truck manufactures in other international markets, in some cases decades earlier. The cost was not significant, only a few hundred dollars, and the weight increase was negligible, only a few kilograms. Hence the voluntary adoption of ABS was viable for truck manufactures and operators alike.

[5] *Road Safety Advisory Council, 2015.*

In contrast, Front Underrun Protection System (FUPS) added over 100kg to the front axle of a truck (an axle that was typically already loaded to the maximum statutory weight limit) and the cost of the FUPS device was typically over $1000 per truck. It took front axle mass concessions from the States and Territories and the eventual mandating of FUPS under ADR 84/00, in 2012, before significant fitment rates were realised. This delayed voluntary uptake, and delayed the safety benefits of FUPS technology.

FUPS reduces the likelihood that the occupants of a light vehicle will become trapped underneath a truck, and ensures that the safety features of the car are correctly deployed, in the event of a truck/light vehicle crash. Australian Government mandated FUPS from 1st January 2012 (ADR84/00). The ADR 84/00 RIS estimated that, by 2017, 11 lives per year could be saved with the fitment of FUPS, IF the entire truck fleet above 12t GVM were fitted with FUPS. TIC estimates that due to the current uptake rates/fleet age, just over 20% of the Australian truck fleet was actually fitted with FUPS in 2017, a saving of only two to three lives. In fact, TIC estimates that a 95% fitment rate of FUPS will not be achieved before 2039 based on current uptake rates/fleet age. This is a less than optimal safety outcome that is a direct result of Australia's aged truck fleet.

2. Vehicle types/combinations that prevent, or reduce the likely incidence of crashes and improve road safety outcomes.

The last decade has seen the take-up rates of Performance Based Standards (PBS) trucks and truck/trailer combinations increase substantially in Australia. The PBS scheme allows the approval of heavy vehicles that are dimensionally greater and/or heavier than Prescriptive regulated trucks. PBS vehicles must be tested and approved to protocols that are equal to, or typically, more stringent than those that apply to Prescriptive regulated trucks. The benefit to operators is that PBS vehicles can carry larger and/or heavier loads than Prescriptive regulated trucks. The benefit to other road users is improved safety outcome. The most recent review of PBS performance was conducted by the National Transport Commission (NTC) in 2017. That research by the NTC into these more efficient/productive PBS heavy vehicles, showed that they were also producing significant safety benefits. NTC's 2017 report, 'Assessing the Effectiveness of the PBS (Performance Based Standards) for Safer Vehicles', details an 86% reduction in crashes for PBS vehicles for the same distance travelled when compared to conventional Prescriptive heavy vehicle combinations. Table 3.1 summarises the safety benefits in avoided fatalities of conventional Prescriptive versus PBS vehicles, measured against two parameters: 1) distance travelled; and 2) registered vehicles.

Truck Type	Fatal crashes per 100 million km (rate as at 2014)	Fatal crashes per 10,000 registered trucks (rate as at 2015)
Rigid trucks	0.80	2.23
Rigid PBS trucks	0.0	0.00
Articulated Trucks	1.30	10.53
Articulate PBS Trucks	0.49	1.07

Table 3.1: Prescriptive vs PBS Truck Fatal Crash Rates by Truck Configuration.
(Source: National Heavy Vehicle Regulator (NHVR) website September 2024)

With regard to PBS vehicle safety, the National Heavy Vehicle Regulator (NHVR) states: "PBS vehicles are involved in 46% fewer major crashes per kilometre travelled than conventional heavy vehicles, and they continue to meet higher safety standards using innovative design and the latest safety technologies. PBS combinations are more productive as they have the capacity to transport more freight per trip, reducing the total number of heavy vehicles on our roads. Fewer trucks on our roads means road users have less exposure to heavy vehicles, reducing the risk of crashes, lowering potential road trauma incidents, and creating safer roads for everyone."[6]

However, despite the increased uptake of these significantly improved safety performing PBS vehicles, their uptake continues to be stifled by state and local government controlled road access restrictions. More action is required to remove these access restrictions while improving the process for road access approval in the first instance, so as to unlock the true safety and productivity benefits of PBS vehicles.

Similarly, crash statistics show that the safety performance of B-double combinations per tonne of freight moved is better than semi-trailer combinations. The NTIs Crash Investigation Report 2023 details that, on average in 2022, a B-double

[6]*National Heavy Vehicle Regulator (NHVR) website September 2024.*

is 20% less likely to be involved in a major crash than a semi-trailer combination and where inappropriate speed was involved, B-doubles were 38% less likely to be involved in an inappropriate speed related incident. Despite the safety and productivity benefits of the B-double configuration, New South Wales Road Maritime Services (NSW-RMS) data shows that approximately 50% of all freight movements of articulated vehicles on the Hume highway through Marulan are completed by semi-trailers. Transferring freight from semi-trailer combinations to B-double combinations is a logical step in reducing road fatalities and injuries, as well as providing a significant decarbonisation opportunity for the road freight sector (refer to Chapter 4: A Greener Australian Truck Fleet).

3. The effect that the age of the Australian truck fleet has on the uptake of heavy vehicle safety systems and technologies that prevent, reduce, or mitigate the likely effects of driver fatigue and/or distraction and inappropriate vehicle speed.

According to National Transport Insurance (NTI), the leading cause of truck incidents/crashes in 2022 continued to be driver inattention/distraction, which was the proximate cause of 15.7% of in-scope incidents once the impact of the extreme weather events of 2021 were removed. This represents a small decline on the figures seen in 2021 (16.4%) and also a reversal of the previous year-on-year increases.[7]

Truck manufacturers are committed to building safer trucks and advanced technologies continue to be deployed in many new trucks. These systems are increasingly available to assist truck drivers making road travel safer for all users. For example, Lane Departure Warning Systems (LDWS) warn a driver when a truck is drifting out of its chosen lane. Autonomous Emergency Braking Systems (AEBS) automatically apply a truck's brake systems to prevent, or at least significantly reduce, rear-end collisions. Emerging technologies, such as driver Fatigue Warning Systems (FWS), monitor the driver and alert them when the onset of fatigue, or distraction, is detected. The slight fall in driver related inattention/distraction incidents/crashes in 2022 verses 2021, noted by NTI, is thought to be due to the increasing take-up of these advanced driver assist technologies.

The Department of Infrastructure Transport Regional Development Communications and the Arts mandated AEBS (ADR97/00) in 2022 with an implementation timeline for new trucks from November 2023 to February 2025 and mandated LDWS (ADR99/00) in 2023 with an implementation timeline from September 2026 to September 2027.

Inappropriate speed, a vehicle travelling too quickly for the given road and environmental conditions is the second largest cause of heavy vehicle incidents/crashes in Australia in 2022 according to the NTI. NTIs examination of these inappropriate speed incidents showed that the overwhelming majority (71.6%) of these crashes are 'off path on curve' events, see Figure 3.1.

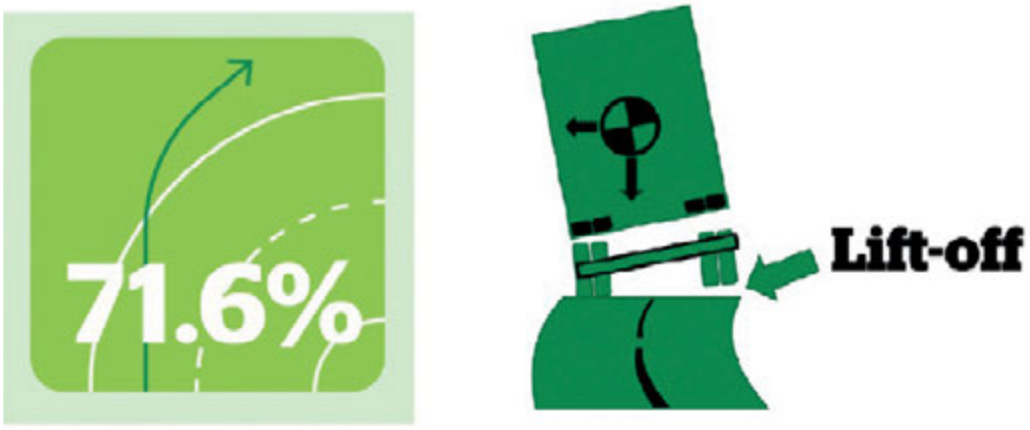

Figure 3.1: *The instance of 'off path on curve' events and the typical resultant 'lift-off' and vehicle rollover outcome due to inappropriate speed.*

[7] *National Transport Insurance P/L (NTI) - Crash Investigation Report 2023.*

In most cases these incidents take the form of 'single vehicle untripped rollovers' where due to the combination of the dynamics of the vehicle, its load, the geometry of the road and, critically, its speed, the vehicle overturns on the roadway.

Further, the NTI found that examining the combination types involved in inappropriate speed crashes, Semi-trailer combinations were over-represented when compared to all vehicle types. The NTI surmised that this may relate to their use in time-critical short-to-medium haul freight, supporting the position that this a short and medium-haul issue relating to a combination of supply-chain pressure and drivers under-assessing risk due to a high degree of familiarity with the route. However, the NTI noted that Rigid trucks are under-represented, despite sharing many of the same operating pressures and road environment as Semi-trailer combinations. While the rational for this type of heavy vehicle incident type is not conclusively known/understood, there is a well proven vehicle technology that will significantly mitigate such crash types. This technology is Electronic Stability Control (ESC) which incorporates an anti roll function.

The Department of Infrastructure Transport Regional Development Communications and the Arts mandated ESC (ADR35/06) in 2018 with an implementation timeline for new Prime Movers and short wheelbase Rigid trucks from November 2020 to January 2022 and ADR35/07, extended the mandate in 2022 to all other Rigid truck types with an implementation timeline from November 2023 to February 2025.

The effectiveness of these advanced safety systems in the Australian context/use case, was first reviewed by the Monash University Accident Research Centre (MUARC) in the September 2014 in their report, *Potential Safety Benefits of Emerging Crash Avoidance Technologies in Australasian Heavy Vehicles.* It was estimated by MUARC that 104 lives could be saved per annum if four advanced safety features were implemented across all heavy vehicles in the Australian truck fleet, those systems detailed above. This MUARC information is summarised in Table 3.2.

Technology	**Lives saved**
Autonomous Emergency Braking Systems (AEBS)	67
Lane Departure Warning Systems (LDWS):	16
Electronic Stability Control (ESC):	11
Fatigue Warning Systems (FWS):	10
TOTAL	**104**

Table 3.2: Advanced Truck Safety Technologies and Lives Saved.

In further research developed by MUARC in August 2021 entitled *The Potential Benefits of Lane Keep Assist Systems in Australian Light Vehicles* and publicly released in March 2023, researchers looked at light vehicle crash data making the following conclusions (light vehicles having greater fitment rates of LDWS and Lane Keep Assist Systems (LKAS) and hence providing a more statically relevant evaluation of the effectiveness of this crash avoidance technology).

A statistically significant 16% reduction in the risk of involvement in all sensitive casualty crashes was associated with LKAS fitment to Australian light vehicles. Effectiveness increased with crash severity with a 12-13% reduction estimated for non-injury and minor crashes, and a 22% reduction estimated for fatal and serious injury crashes.

While the crash and injury severity numbers are not directly transferable to heavy vehicles, the LDW and LKAS systems in heavy vehicles perform the same fundamental crash avoidance task as seen in light vehicles, hence this latest MUARC study further confirms the effectiveness of these safety systems in all vehicle types and supports the 2014 heavy vehicle study results.

It must be noted that the number of lives saved projected by the introduction of these advanced vehicle safety systems is only realised once ALL vehicles in the fleet have these systems fitted. Due to the age of the Australian truck fleet, it will take decades for

these safety benefits to come to fruition across all trucks. The sobering reality born out of TIC's own analysis shows that with the current uptake rates/fleet age applied, it will take until 2050 for 95% of the fleet to be fitted with ESC and until the year 2053 for 95% of the fleet to be fitted with AEBS based on the ADR implementation dates.

The realisation of the safety benefits of LDWS will take even longer, with TIC's modelling suggesting that a 95% fitment rate will not be achieved across the truck fleet for LDWS until 2056.

Fatigue Warning Systems (FWS) are not even under consideration at present by the Australian government. In simple terms, the 94 lives saved per year as detailed in the MUARC Report 2014 (the 10 lives saved by FWS not being considered/counted) would not be realised until sometime beyond 2056, with only incremental benefits being achieved until then. This poor result can be directly attributed to the age of the Australian truck fleet, which sits at approximately twice that of most European countries.

4. The effect that the age of the Australian truck fleet has on Heavy Vehicle roadworthiness.

The National Heavy Vehicle Regulator (NHVR) has been tasked by the Federal, State and Territory Transport Ministers with improving the roadworthiness of the in-service heavy vehicle fleet and enforcing consistency across Australia, noting that the NHVR does not have direct authority in either Western Australia (WA) or Northern Territory (NT). From August through to November 2016, the NHVR coordinated the first ever roadworthiness check of the Australian heavy vehicle fleet, with the exception of Western Australia.

Based on the Heavy Vehicle Inspection Manual, major non-conformances (defects) were found from the several thousand heavy vehicles surveyed. The National Roadworthiness Baseline Survey (NRBS) 2016 was used to set a reference point for Australia's heavy vehicle fleet.

Subsequently the NHVR conducted a follow-up roadworthiness survey of the Australian heavy vehicle fleet in 2021, including NT and WA).[8]

The overall conformity of hauling units increased nationally from 68% in 2016 to 84% in 2021. The scale of increase in conformance was broadly consistent across different types of hauling units from Rigid Trucks (up 15% to 63%), Semi-Prime Movers (up 17% to 69%), B-double-Prime Movers (up 16% to 75%) and Road Train-Prime Movers (up 17% to 75%). Conformities increased amongst hauling units registered in NSW (up 14%), VIC (up 22%), QLD (up 8%) and TAS (up 12%). However, there has been an increase in the incidence of non-conformity in the ACT (up 14%). Those with the lowest levels of non-conformity were WA (17%), NT (20%) and SA (28%). The incidence of non-conformity was greater for vehicles registered in QLD, TAS and the ACT.

Vehicle age had been found in NRBS 2016 to be strongly associated with the incidence of non-conformities. A profile of age of vehicle units was assessed to provide context to the roadworthiness results. The age of each truck was calculated based on the date of manufacture, referenced to the survey year for the unit. Overall, 38% of total trucks were assessed to be 12 years and older, and 50% of total trucks were assessed to be 9 years and older. B-double's were the newest, with the average age below 5.5 years. Rigid trucks, buses/coaches, plant/SPV and trailers were again the oldest, with an average exceeding 9 years. Four in ten of each of these unit types were 12 years and older.

There again was a direct relationship between the age of a truck and the incidence of non-conformity. The findings demonstrated that the incidence of non-conformity increased with age. Freight hauling trucks showed the greatest increase with age (from 14% for 0<3 years up to 53% for 12+ years age). Encouragingly there has been a decrease in the level of non-conformity across each age group since 2016.

[8] *NHVR National Roadworthiness Survey Report, December 2021.*

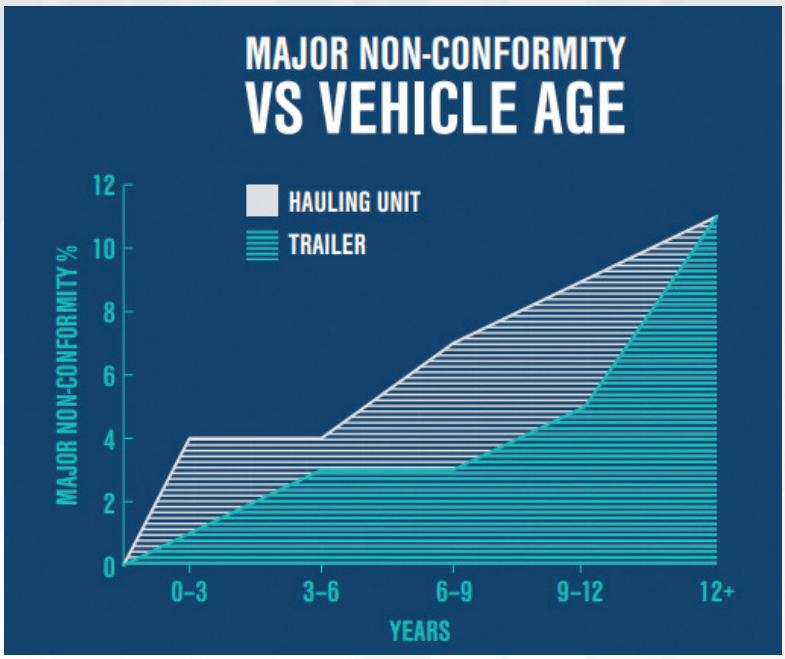

Figure 3.2: Relative rate of major non-conformity verses vehicle age.[9]

The NHVR's survey data conclusively shows that truck roadworthiness major non-conformances rise according to the age of the vehicle (Refer to Figure 3.2).

This rise becomes quite significant beyond six years of age (pre-2015 trucks). To put this into perspective, pre-2015 trucks account for all trucks prior to ADR 80/03 (Euro V and equivalents) emission standard as well as over 35% of ADR80/03 trucks. The 2021 survey results showed that greater than one in two pre-2010 trucks were likely to have a major non-conformance. This is a significant issue which could be largely addressed by renewing Australia's truck fleet. The impact on heavy vehicle crashes and potential lives saved due to improved heavy vehicle roadworthiness has not been evaluated as part of this plan. This remains an area of continued study by the Federal, States and Territories governments and the NHVR.

[9]*NHVR National Roadworthiness Survey 2021 Facts Sheet.*


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Chapter 4: A Greener Australian Truck Fleet

1. INTRODUCTION

The Australian Transport Sector accounts for just over 90 Mt CO_2-e (or 18%) of Australia's annual Greenhouse Gas (GHG) emissions. The operation of Australia's national heavy duty vehicle fleet generates 19.8 MT CO_2-e (or 22%) of all Transport Sector emissions, which equates to about 4% of Australia's total annual GHG emissions.[10]

The Transport Sector has experienced the highest GHG emissions growth of all industry sectors since 1990 and is expected to become the largest source of GHG emissions by 2030, with the national vehicle fleet (both light-duty and heavy-duty vehicles) accounting for around 72% of the forecast 111 Mt CO_2-e of emissions to be generated by the Sector in 2030.[11]

This understanding of the GHG emissions challenge facing Australia suggests that there is an urgent need to develop strategies to mitigate growth in the Australian Transport Sector. The Truck Industry Council (TIC) recognises that it has a significant role to play in contributing to a progressive reduction in GHG emissions generated by the national truck fleet.

This chapter provides a forecast of the likely architecture of the national truck fleet, a prediction of business as usual (BAU) emissions in 2030, and a high-level discussion of the three strategies that exist to lower GHG emissions in the near term.

[10]Transport and Infrastructure Net Zero Consultation Roadmap May 2024.

[11]Transport and Infrastructure Net Zero Consultation Roadmap May 2024.

2. STRATEGIC CONTEXT

Road Freight is the most significant mode of transportation for goods in Australia, accounting for approximately 75% of the total domestic freight moved in Australia by total volume.[12] This proportion has remained largely unchanged since the late 1970's, due principally to the fact that Australia's sparsely populated geography and limited non-road freight infrastructure has meant that this is the most economic mode for movement of freight around the country.

Without significant (and costly) development of alternative national freight infrastructure and a fundamental shift in the delivery expectations of consumers the road freight task will continue to grow at the rate of 3.5% to 4.0% per year (a 50% increase every 10 years).[13]

Constraining this annual growth rate is problematic, if not unrealistic, given that it is directly linked to growth in national economic output and national population growth. There are several contemporary trends that are further increasing growth in national freight demand. Chief amongst these trends is the following:

a) **The rise of the online economy and digital commerce.** This phenomenon has accelerated since COVID and is fundamentally reshaping the traditional nature of the urban road freight task in Australia; from one that was solely optimised around the realisation of organisational freight efficiencies (i.e. between manufacturers, distribution centres, and retailers) to one that is increasingly being co-designed with the customer to optimise tailored delivery times for end-customers (i.e. from manufacturer to end customer). This trend is fragmenting the freight task and has given rise to increased annual sales of new urban delivery trucks in recent years. This has increased focus on the economic and environmental penalties of last mile delivery task.

b) **Changes in logistics industry practices.** The past decade has seen a significant change in Australian supply chain practices where goods are no longer automatically warehoused to reduce delivery times to Australian consumers. As a result, increasingly, manufactured goods are typically transported directly 'off the production line' to retailers or the end customer. This trend has had the effect of reducing freight productivity as goods are transported in small average unit volumes than would ordinarily have occurred in the past.

Within this context and given the Australian Government's Net Zero 2050 emissions ambition, the below discussion seeks to: (a) quantify the business-as-usual (BAU) emissions from the national truck fleet in 2030 and (b) identify measures that could be pursued to reduce GHG emissions over the next 5 years.

3. FORECAST FLEET ARCHITECTURE (2025 TO 2030)

TIC commissioned research to estimate the composition of the national truck fleet to 2030. This work involved the construction of a 2020 baseline fleet using ABS Vehicle Census Data. Annual average fleet attrition rates (2015 to 2020) and annual truck sales data were then used to forecast the composition of the national truck fleet in 2025 and 2030.

The findings of this work forecast that the national truck fleet will increase to approximately 850,000 vehicles by 2030. The forecast architecture of the national heavy vehicle fleet in 2030 is detailed in Figures 4.1 below. The forecast age composition of the fleet (grouped by emissions ADR) is shown in Figure 4.2.

[12]Transport and Infrastructure Net Zero Consultation Roadmap May 2024.

[13]Transport and Infrastructure Net Zero Consultation Roadmap May 2024.

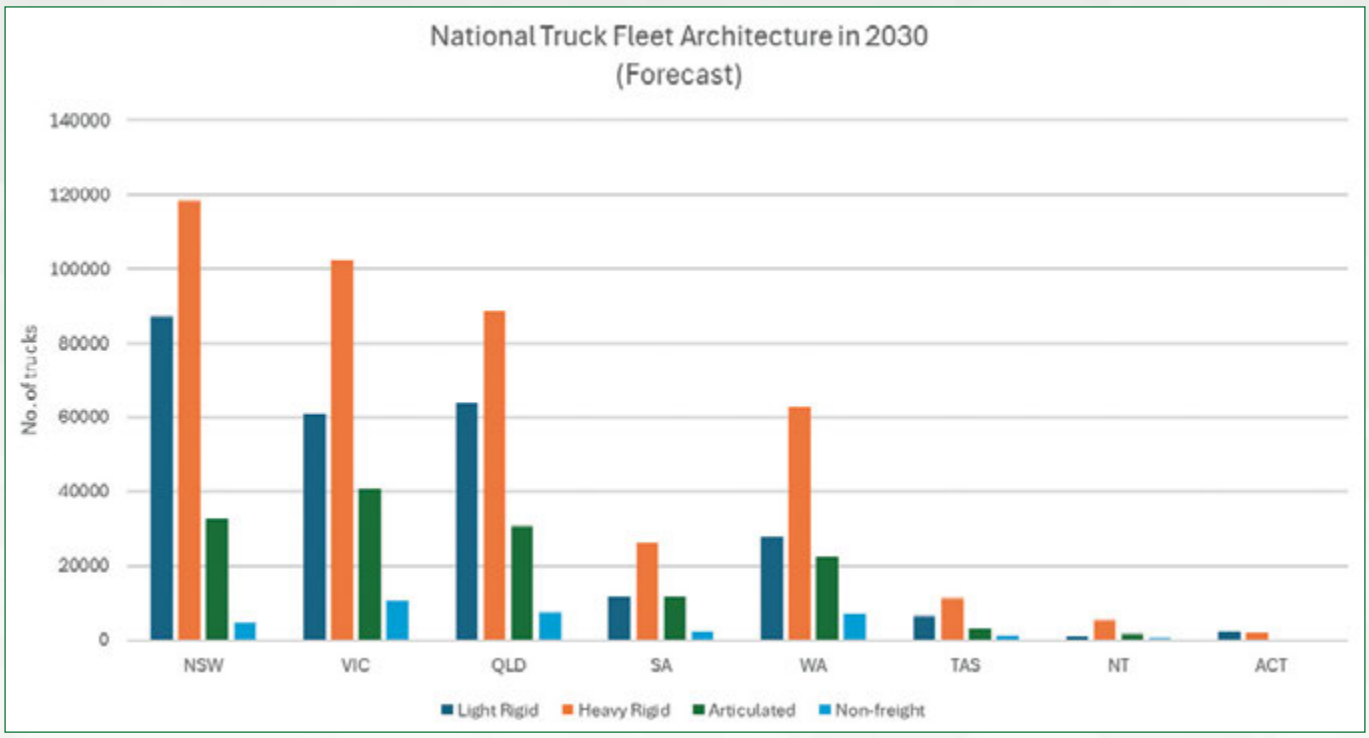

Figure 4.1: *The national truck fleet will increase from 687,683 (2020) to an estimated 853,577 trucks (2030).*

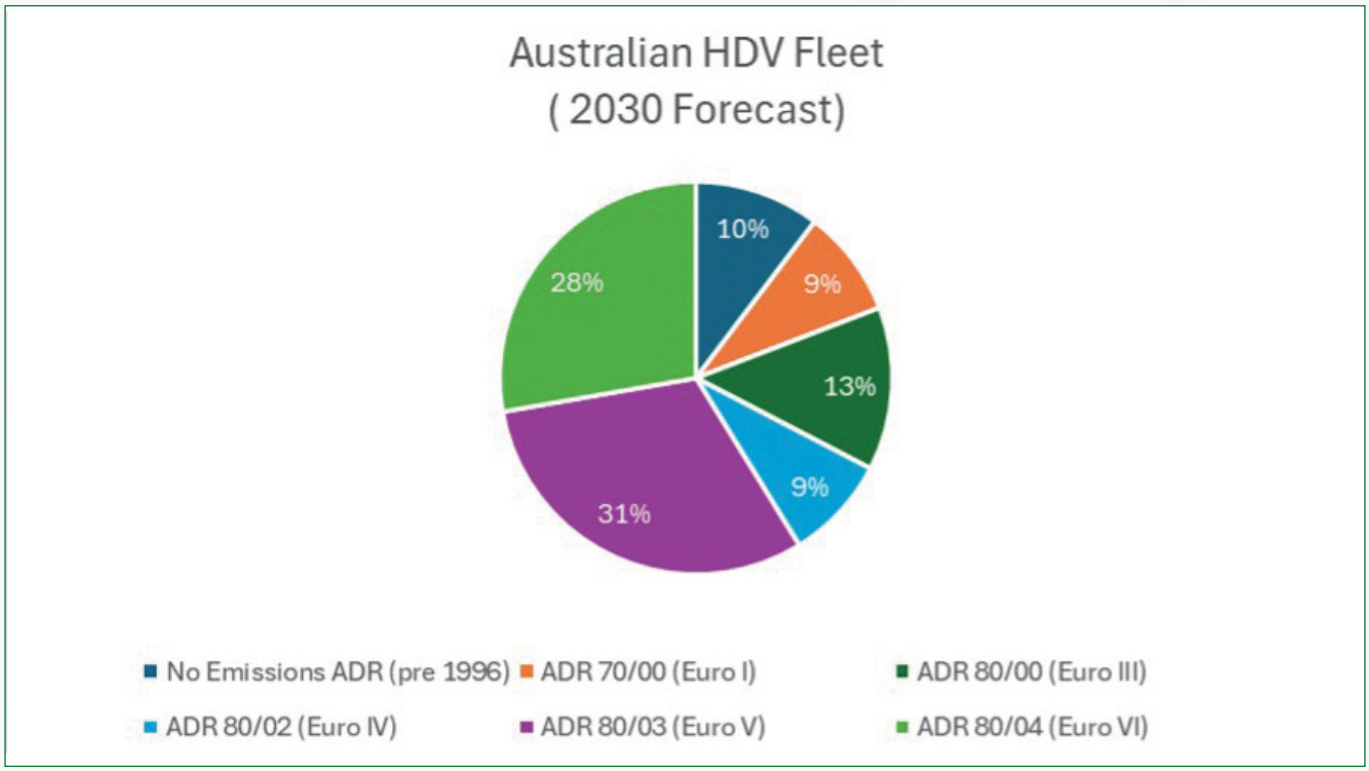

Figure 4.2: *One third of the national truck fleet will be 23 years or older in 2030.*

The analysis revealed that the size of the national truck fleet will increase by an estimated 108,000 trucks between 2025 and 2030 (and an increase of 166,000 when compared with the 2020 truck fleet). The analysis also predicts that 32% of the national truck fleet (272,960 trucks) will be over 23 years old in 2030, that is, trucks pre 2007 (ADR 80/02 – Euro IV).

4. FORECAST GHG EMISSIONS (2025 TO 2030)

The GHG emissions of the national heavy duty vehicle fleet are forecast to increase to 21.262 Mt CO_2-e by 2030. This represents an increase of 2.667 Mt CO_2-e (14%) above forecast 2025 levels and an increase of 4.052 Mt CO_2-e (23.5%) above 2020 levels as shown in Figure 4.3.

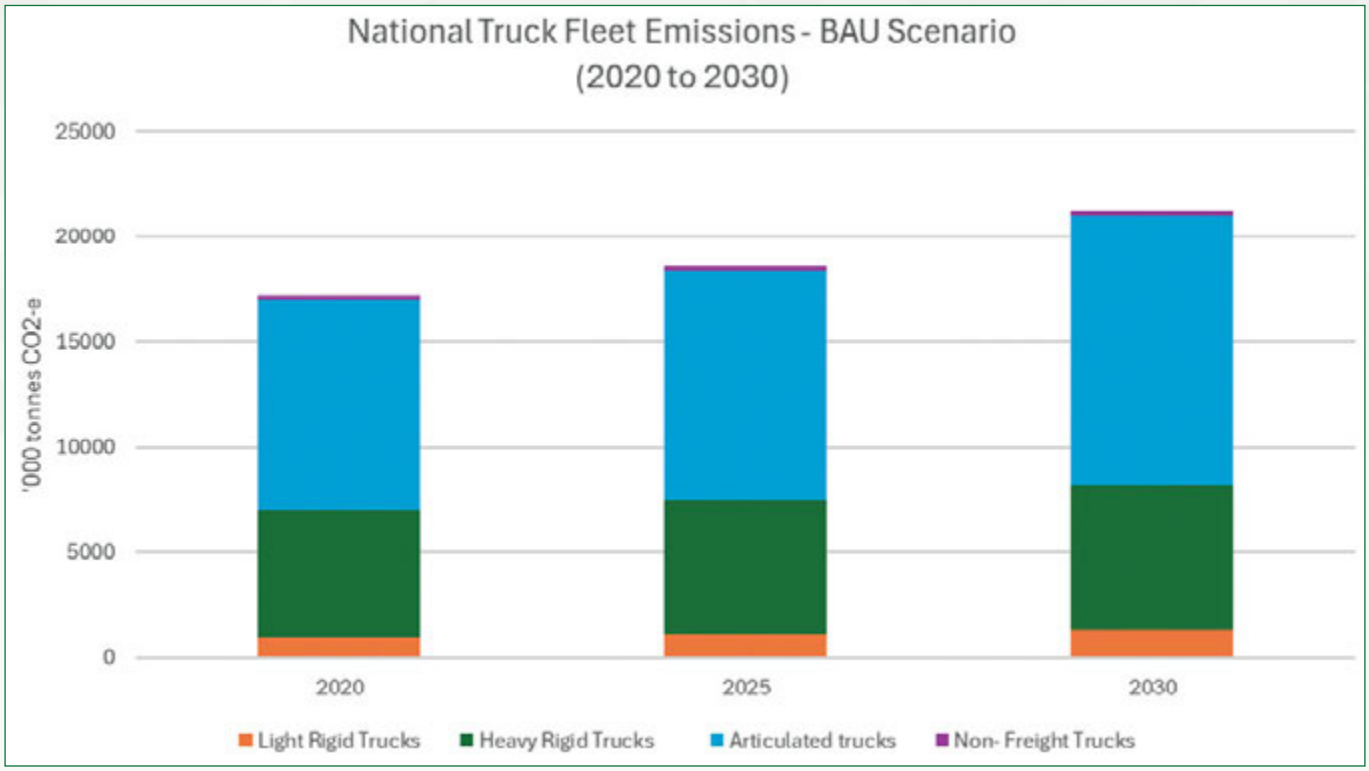

Figure 4.3: *GHG emissions are forecast to increase by 4.052 Mt CO_2-e between 2020 and 2030.*

GHG emissions from articulated trucks will account for 69% of the projected increase between 2020 and 2030 – and 60% of the total GHG emissions produced by the national truck fleet in 2030 (refer Figure 4.4)

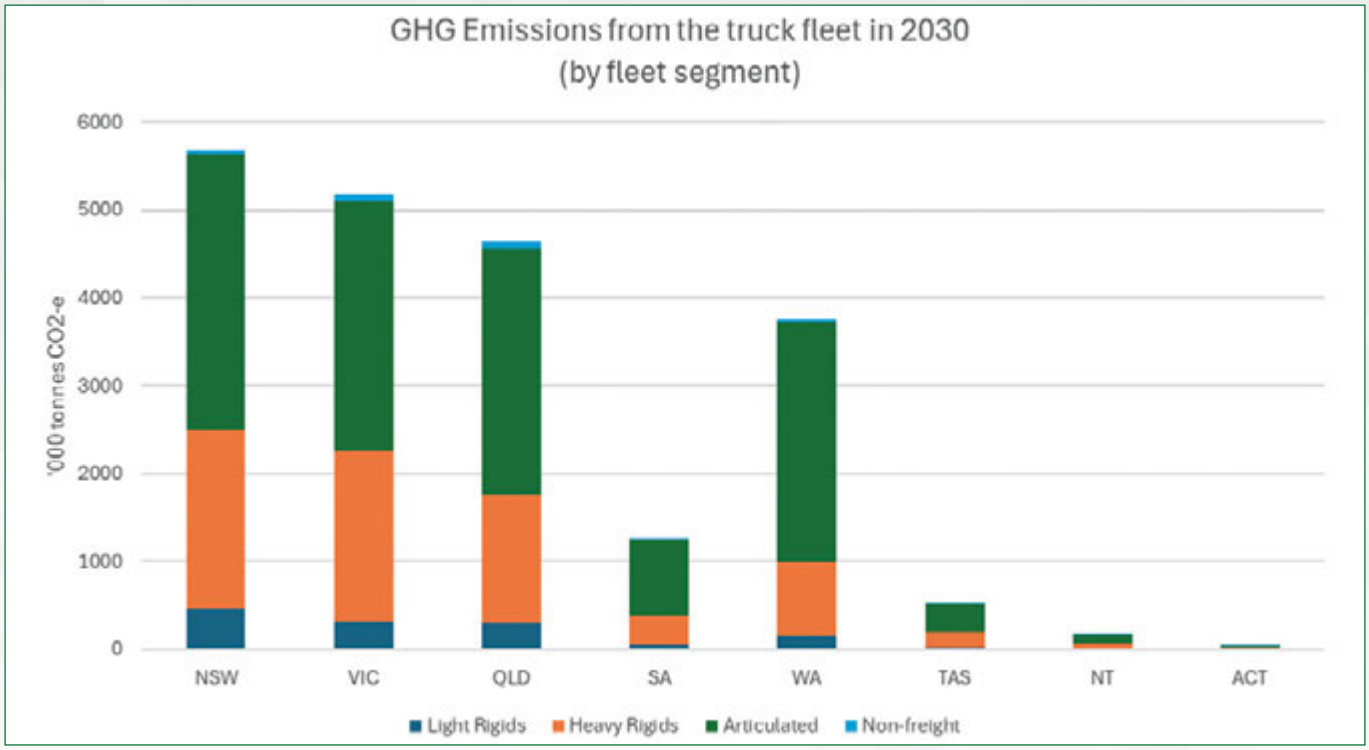

Figure 4.4: *GHG emissions from articulated trucks are forecast to account for 60% of the total GHG emissions produced by the national truck fleet in 2030.*

The GHG emissions production rate of a new articulated truck in 2030 is forecast to produce 5.5x more GHG emissions than a new heavy rigid truck, 10.9x more GHG emissions than a new non-freight truck, and 17.9x more emissions that a new light rigid truck (refer Figure 4.5).

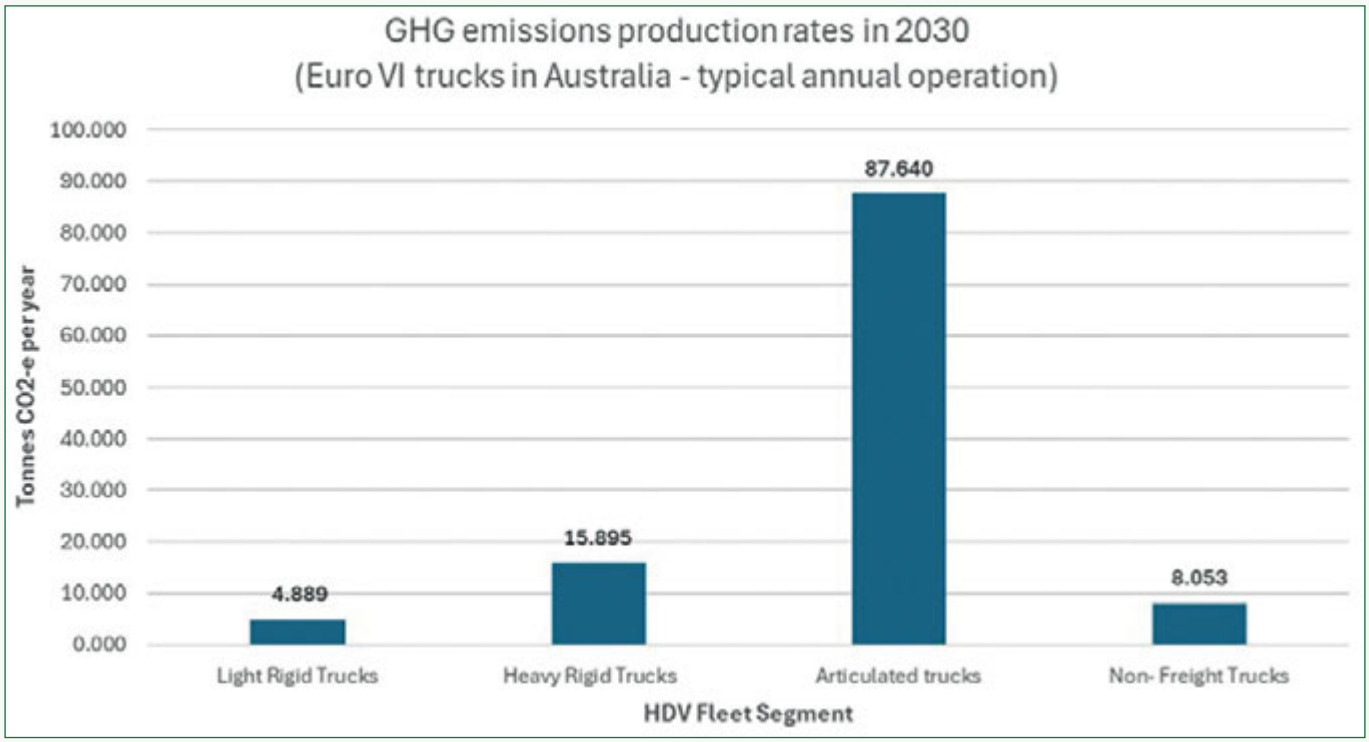

Figure 4.5: *New articulated trucks will produce 5 times more emissions than new heavy, rigid trucks and nearly 18 times more GHG emissions than new light, rigid trucks in 2030.*

5. OPPORTUNITIES FOR NEAR-TERM GHG EMISSIONS REDUCTION

The nature of the opportunities to reduce GHG emissions from the national truck fleet can be grouped into three categories, namely: (a) adoption of low carbon drive trains such as Battery Electric Vehicles and Hydrogen Fuel Cell Electric Vehicles, (b) adoption of low carbon liquid fuels, and (c) realisation of freight productivity improvements.

5.1. Low carbon drivetrains (new trucks only)

Current technological developments and shifting energy geopolitics suggest that near-term sales of large numbers of new trucks powered by low carbon drivetrains (i.e. BEV and PHEV) in the high fuel use sectors, for example line haul, in Australia is unlikely before 2030 to 2035.

Over the next 5 years, the greatest opportunity for the adoption of low carbon drivetrains is likely to be constrained to the early market entry of small numbers of BEVs within the lighter segments of the national truck fleet – that is, light, medium and heavy rigid trucks.

The forecast reduction in 2030 GHG emissions associated with a modest take up of new BEVs between 2025 and 2030 is estimated to be between 0.022 Mt CO_2-e and 0.144 Mt CO_2-e (refer Table 4.1), assuming achievement of the Government's 82% renewable electricity generation target.

It is worth noting that the scenarios presented in Table 4.1 are provided for illustrative purposes. The likely high capital cost premium of these vehicles, coupled with likely limited availability between 2025 and 2030 suggests that realisation of these scenarios may be challenging.

Assumed % of total sales of new BEV trucks (5 year period between 2025 & 2030)	**Estimated reduction in 2030 Emissions** *(MT CO_2-e)*
Light Rigid trucks	
10% of annual sales	0.022
20% of annual sales	0.044
40% of annual sales	0.088
Heavy Rigid trucks	
10% of annual sales	0.05
20% of annual sales	0.113
'Best endeavours' scenario	
40% of LRT sales and 10% of HRT sales	0.144

Table 4.1: *Sales of new BEV trucks between now and 2030 are likely to be small and unlikely to deliver any significant reduction in GHG emissions from the national truck fleet in 2030.*

Under the 'Best endeavours' scenario, government assistance targeting the purchase of 25,500 new BEV trucks (21,400 LRTs and 4100 HRTs) sold between 2025 and 2030 would reduce annual GHG emissions produced by the truck fleet by 0.144 MT CO_2-e. This represents a reduction of 3.5% of the forecast 4.052 MT CO_2-e increase in GHG emissions predicted to 2030.

The above analysis suggests that financial incentives for the purchase of new low carbon drivetrain will be required to catalyse growth in the market adoption of these vehicles (and realise significant emission reductions) over the medium to long term. Ideally, this would be achieved via the design and implementation of a dedicated grants program for LRT and HRT electric trucks.

5.2. Low carbon liquid fuels (whole-of-fleet application)

The principal benefit of utilising low carbon liquid fuels is that the wholesale compatibility of these fuels with conventional internal combustion engine technology means that they can be used to deliver emissions reduction across the entire fleet, that is, old and new trucks, as opposed to relying on the gradual market adoption of new low carbon drivetrain technology vehicles.

These fuels, specifically renewable diesel and synthetic diesel, have the potential to lower GHG emissions by 80% or more when compared with emissions generated by conventional diesel consumption in the national truck fleet.[14]

Unfortunately, the near-term market take-up of these fuels is constrained by both limited national supply in 2025 (i.e. limited to small import volumes) and a significant cost premium relative to conventional diesel. Early market experience suggests that 'neat' renewable diesel is 1.5 times more expensive than conventional diesel and synthetic diesel is 2.5 times more expensive.

A realistic strategy for delivery of an emissions reduction by 2030 is the market utilisation of renewable diesel blends such as R10 (10% renewable diesel) and R20 (20% renewable diesel). These blends are estimated to add between 12cpl (R10) and 24cpl (R20) per litre of diesel consumption.

The forecast reduction in 2030 GHG emissions associated with a modest take up of renewable diesel blends is between 0.255 Mt CO_2-e and 1.020 Mt CO_2-e (refer Table 4.2)

Assumed annual sales of renewable diesel within the national truck fleet in 2030	Estimated reduction in 2030 Emissions *(MT CO_2-e)*
R10 (10% renewable diesel and 90% conventional diesel)	
10% substitution of annual diesel consumption	0.255
30% substitution of annual diesel consumption	0.510
50% substitution of annual diesel consumption	0.850
R20 (20% renewable diesel and 80% conventional diesel)	
5% substitution of annual diesel consumption	0.255
10% substitution of annual diesel consumption	0.520
30% substitution of annual diesel consumption	1.020
'Best endeavours' scenario	
30% R10 substitution	0.510

Table 4.2: *Market utilisation of renewable diesel blends have the potential to deliver significant GHG emission reductions from the operation of the national truck fleet in 2030.*

While the principal challenge with market adoption of renewable diesel is associated with the sourcing of sufficient supply for utilisation in the national truck fleet, this strategy offers the potential to reduce forecast GHG emissions by 0.510 Mt CO_2-e ('Best Endeavours' scenario) – which represents a reduction of 12% of the 4.052 Mt increase in GHG emissions predicted between 2025 and 2030.

One strategy for incentivising the use of this fuel (i.e. demand side incentive) would be to offset the higher cost of utilisation of this fuel by providing heavy vehicle operators with a reduction in either the road user charge; an increase in the fuel tax rebate or a combination of both, that is commensurate with the cost premium of utilising a low carbon diesel.

5.3. Freight Energy Performance Improvements

Australia's truck fleet grows in proportion to growth in the national road freight task. It therefore follows that increasing the average volume of freight moved per vehicle provides an opportunity to reduce growth in the national truck fleet and reduce GHG emissions. High productivity vehicles provide an opportunity to move road freight, particularly bulk freight, with greater levels of energy productivity.

[14]A Deep Dive into Renewable Diesel Cummins Inc. May 16, 2024.

Given that articulated vehicles accounted for 58% of all GHG emissions produced by the national truck fleet in 2025 and are projected to account for 60% of these emissions in 2030, strategies that improve the energy productivity of this truck segment present significant potential to reduce GHG emission from the national truck fleet.

By comparison with the typical average load transported by a semi-trailer (i.e. 32.5t payload), a prime mover operating with a B-Double combination delivers a 48% increase in payload for a 10% increase in average annual fuel consumption. Similarly, a B-triple delivers an average 77% increase in payload for a 15% increase in average annual fuel consumption.

Considering these combinations on a GHG emissions basis, replacement of a semi-trailer with a B-Double delivers a 29% reduction in annual emissions. Similarly replacement of an articulated vehicle with a B-triple delivers a 35% reduction in annual GHG emissions (refer Figure 4.6).

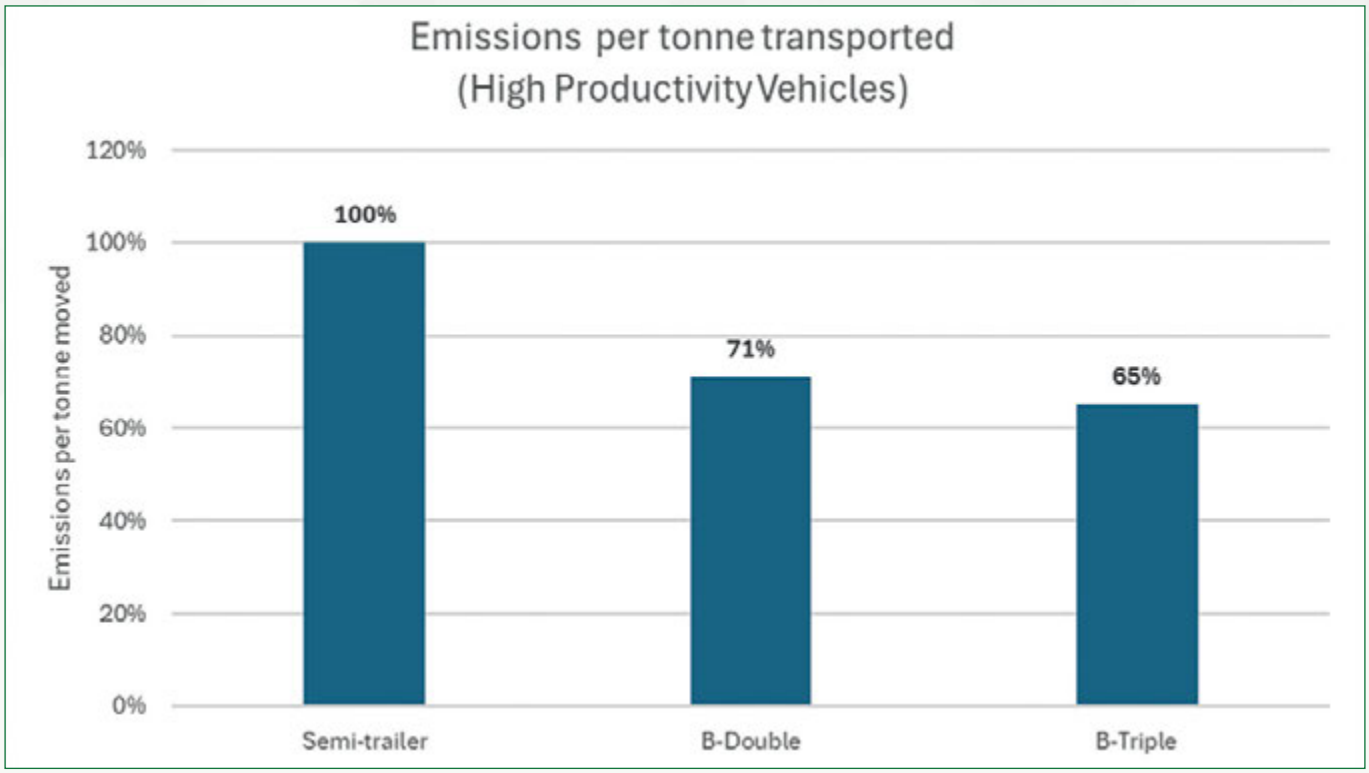

Figure 4.6: *Increased utilisation of high productivity vehicles within the articulated truck segment offers significant potential for emissions reduction to 2030 and beyond.*

An indication of the impact of increased numbers of High Productivity Vehicles (within the national articulated vehicle segment) relative to the other two emission reduction strategies discussed in this section was derived by constructing two modest scenarios of semi-trailer replacement, namely:

- 10% replacement of existing semi-trailers with B-Doubles
- 10% replacement of existing semi-trailers with B-Triples

This analysis revealed that increased numbers could deliver annual GHG emission reductions of between 374,000 and 448,000 tonnes of CO_2-e.

6. SUMMARY OF KEY INSIGHTS

The discussion presented in this chapter gives rise to the following observations in respect of the GHG emissions of the national truck fleet to 2030.

1. The national truck fleet is forecast to grow by 108,000 units to 853,000 trucks between 2025 and 2030.
2. GHG emissions from the national truck fleet are forecast to increase by 4.052Mt to 21.262 Mt CO_2-e by 2030 which represents an increase of 23.5% above 2020 emission levels.
3. A portfolio of three strategies could be simultaneously pursued for the realisation of significant GHG emissions reductions over the near term. These strategies target different segments of the fleet and can be summarised as follows:

a) **Strategy 1: Replacement of ICE drivetrains with BEV technology within the LRT and HRT segments** The significantly higher capital cost of BEV vehicles suggests that there will likely be a need for the design and implementation of a government financial assistance program for new vehicles purchased between 2025 and 2030.

b) **Strategy 2: Increase market adoption of a Renewable Diesel Blend (e.g. R10 and/or R20) in lieu of conventional diesel.** Renewable diesel blends represent a significant opportunity for reduction of GHG emissions across the national truck fleet, subject to the market availability of substantial supply in the near term. Given that these fuels will come at a premium cost, there will likely be a need to provide a financial incentive to negate the cost component (at least in the near term). This incentive could, for example, take the form of a reduction in the RUC for users of renewable diesel blends (i.e. discount of 12cpl for R10 and a discount of 24cpl for R20).

c) **Strategy 3: Increase the utilisation of B-Double and B-Triple combinations (in lieu of single trailers) within the articulated fleet.** This will likely require working with the National Heavy Vehicle Regulator and other stakeholders to expand the High Productivity Vehicles (HPV) Network and to streamline the administration of the Performance Based Standards (PBS) Scheme.

4. Substitution of renewable diesel (minimum 80% reduction in GHG emissions compared with conventional diesel) represents the single biggest opportunity for reduction of GHG emissions from the national truck fleet between now and 2030 (510,000 tonnes CO_2-e). A similar quantum of GHG emissions benefit could be derived by the replacement of 10% of existing semi-trailer combinations with B-Triples (448,000 tonnes CO_2-e) as shown in Figure 4.7.

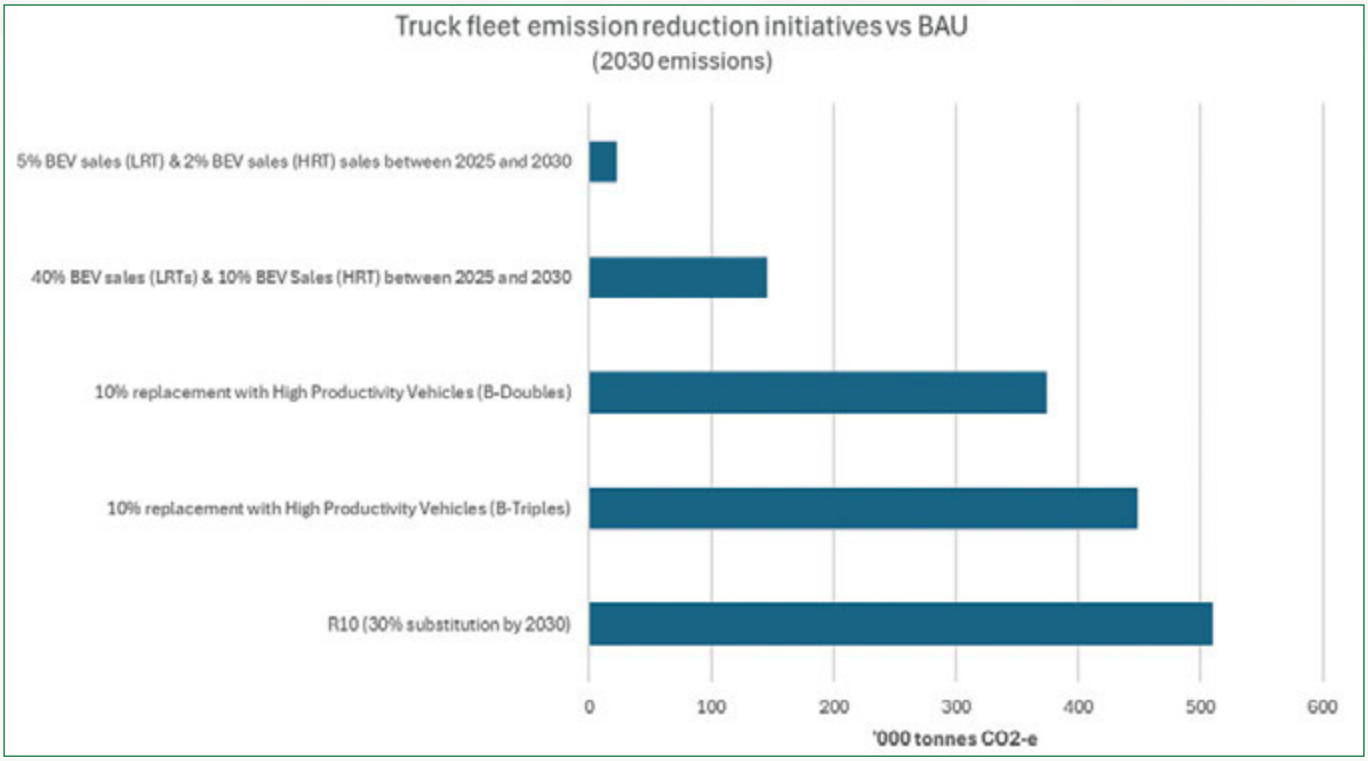

Figure 4.7: *Relative assessment of key opportunities to reduce GHG emissions from the Australian Truck Fleet between 2025 and 2030.*


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Chapter 5: A Cleaner Australian Truck Fleet - Community Health Costs

1. INTRODUCTION

Australian Governments, in conjunction with truck manufacturers, have since 1996 made significant strides in legislating progressive noxious emissions performance standards for new trucks sold in the country. The current standards focus on reducing pollutants such as nitrogen oxides (NOx) and particulate matter (PM), which are critical for improving air quality and public health. It is worth noting that it would take 120 of today's trucks to equal the exhaust emissions (PM) of one 1996 truck (refer to Figure 5.1). However, a substantial portion of the national truck fleet still consists of older vehicles that do not meet these stringent standards, limiting the overall community benefits of these regulations.

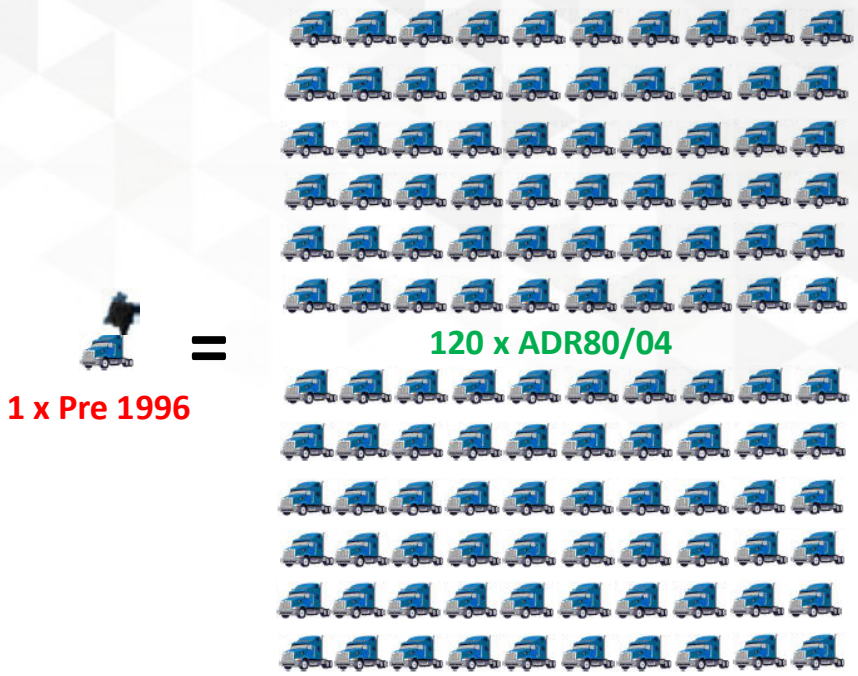


Figure 5.1: *Today's trucks significantly improve air quality and public health; 120 of today's trucks equal the PM emissions of one pre 1996 truck.*[15]

This chapter provides an analysis of the national truck fleet in terms of applicable vehicle emissions standards, forecasts the annual community health costs of the national truck fleet to 2030, and discusses some of the strategies that could be implemented to reduce this cost in the future.

2. STRATEGIC CONTEXT

Emissions from Australia's national vehicle fleet (including trucks) have a significant impact on community health, leading to significant medical and societal costs. Emissions from the national truck fleet, especially older models that do not meet current emissions standards, release large quantities of harmful pollutants such as nitrogen oxides (NOx) and particulate matter (PM). These pollutants contribute to respiratory and cardiovascular diseases, exacerbating conditions like asthma and bronchitis, leading to premature deaths.

An increasing understanding of the links between human health and vehicle emissions, particularly diesel powered trucks, has resulted in the Australian Government legislating stricter emission standards for new trucks over the past nearly 30 years (See Table 5.1). The progressive introduction of these standards has targeted reduction of the concentration of vehicle related pollutants in the airsheds of Australia's capital cities and populous Regional Centres.

[15]Truck Industry Council.

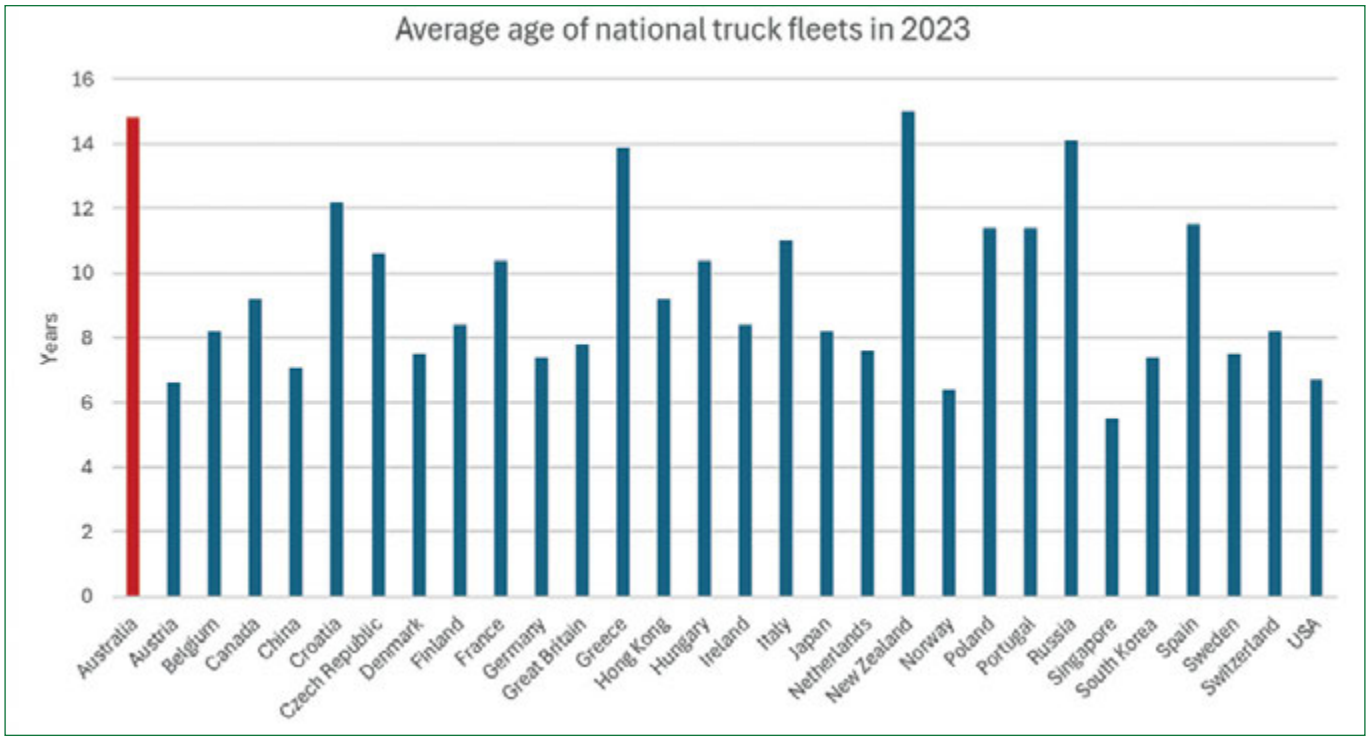
Emission Standard	CO (note 1) *(g/kWh)*	HC *(g/kWh)*	NOx *(g/kWh)*	PM *(g/kWh)*
No Emissions ADR (pre 1996)	NA	NA	NA	NA
ADR 70/00 (Euro I): 1995/1996 (note 2)	4.50	1.10	8.00	0.36
ADR 80/00 (Euro III): 2002/2003	2.10	0.66	5.00	0.10
ADR 80/02 (Euro IV): 2007/2008	1.50	0.46	3.50	0.02
ADR 80/03 (Euro V): 2010/2011	1.50	0.46	2.00	0.02
ADR 80/04 (Euro VI): 2024/2025	1.50	0.46	0.40	0.01

Note 1: Quoted emission limits are stipulated for European Stationary Cycle (ESC) test protocols.
Note 2: The first date applies to new models and the second to all new trucks sold.

Table 5.1: *Summary of the timing and scope of progressive tightening of emission standards for new truck sold in Australia.*

The potential community benefits of these legislated emission standards have been undermined by the continued use of older trucks, which remain a substantial source of air pollution.

In fact, the average age of Australia's national truck fleet is amongst the oldest of all OECD and SE Asian countries as shown in Figure 5.2.



Note 1: Data derived from National Registration Agencies or Government Departments with trucks being defined as vehicles over 4.5t GVM in North America - and 3.5 t GVM for the rest of the world.

Figure 5.2: *Comparison of the average age of Australia's national truck fleet with other international economies.*

It therefore follows that there is a significant opportunity for reducing the average annual community health cost of the nation's truck fleet by advancing strategies that seek to accelerate the renewal of the fleet. While easily articulated, the achievement of this task is complex. It requires a comprehensive understanding of the major sources of emissions production within the national truck fleet and development of strategies that are equitable and do not unnecessarily increase the cost of road freight within the economy.

3. FORECAST FLEET ARCHITECTURE (2025 to 2030)

The vehicle fleet forecast commissioned by TIC to derive the findings presented in Chapter 4 was similarly used to analyse the likely movement in the Community Health Costs associated with the operation of the national truck fleet, between 2025 and 2030. Specifically, this work involved classification of the national truck fleet into age segments that aligned with the evolution of Australia's emission standards for the national truck fleet.

The forecast evolution of the emissions profile of the Australian Truck Fleet between 2020 and 2030 is presented in Figure 5.3.

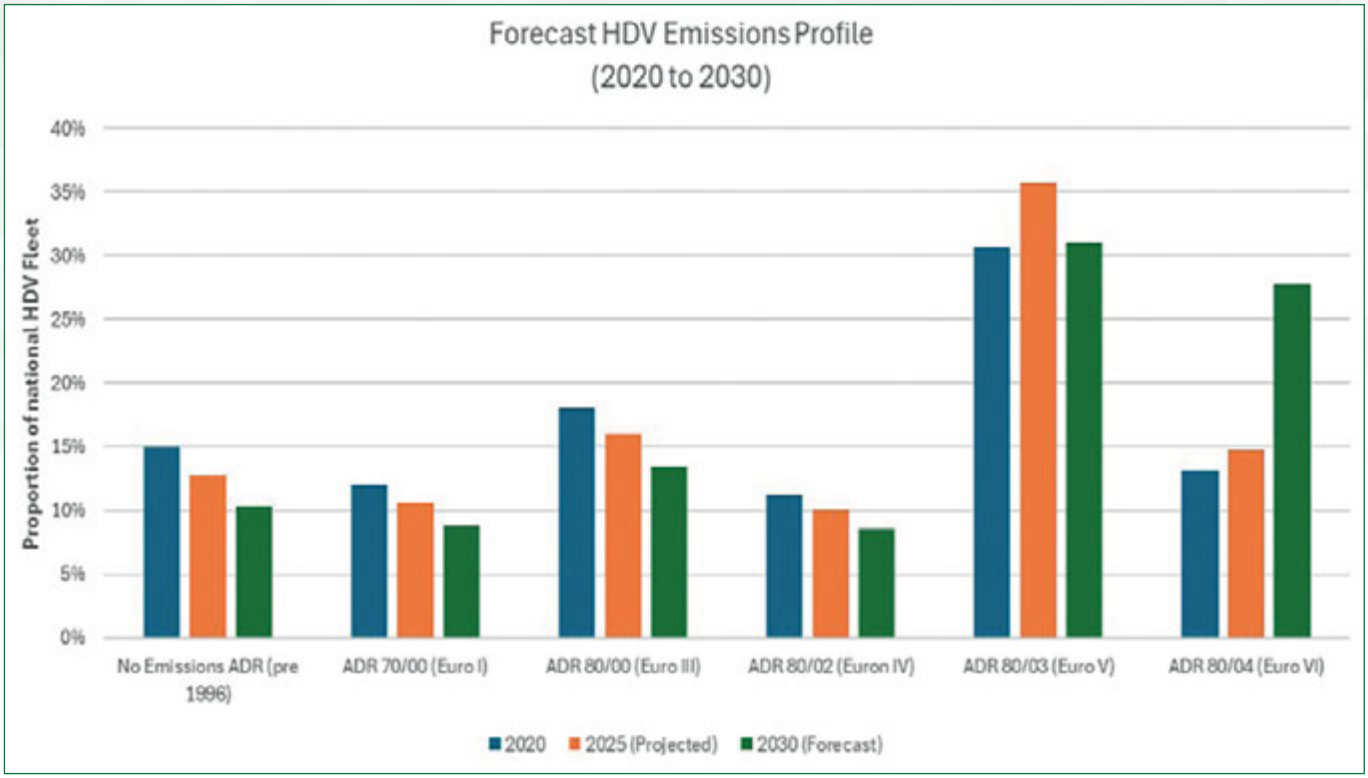


Figure 5.3: *Analysis of the movement in the profile of the national truck fleet between 2020 and 2030.*

Analysis of Figure 5.3 gives rise to the following observations about the likely emissions profile of the national truck fleet in 2030.

- Approximately 19% of the 2030 national truck fleet will be operating at or below the lowest vehicle emission standard (i.e. ADR 70/00). This equates to an estimated 163,504 trucks being more than 27 years old, including:
  - 31,600 light rigid trucks
  - 105,504 heavy rigid trucks
  - 19,900 articulated trucks
  - 6,500 non-freight trucks

- A further 13% of the 2030 national truck fleet will be operating at the second lowest emission standard (i.e. ADR 80/00). This equates to an additional 114,774 trucks being between 23 and 27 years old, including:
  - 25,500 light rigid trucks
  - 65,255 heavy rigid trucks
  - 20,163 articulated trucks
  - 3,856 non-freight trucks

The findings of the analysis give credence to past assessments that the average age of Australia's truck fleet is increasing and is undermining the benefits of tighter emission standard being imposed on the sale of new trucks. Specifically, the total number of trucks older than 16 years of age will increase by 92,278 trucks (or 49%) to an estimated 278,400 trucks between 2020 and 2030.

4. FORECAST COMMUNITY HEALTH COSTS (2025 TO 2030)

The avoided health costs arising from a reduction in vehicle noxious emissions were calculated using average health costs interpolated from previous national and international studies used for the justification of recent changes in vehicle emissions standards – including the recent legislation of ADR 80/04 in Australia. Median health costs were derived for both 'Capital City' and 'Rest of Australia' operation (see Table 5.2).

	A$2024 per tonne reduction		
	HC	NOx	PM10
Capital City Low	$6,457	$772	$172,002
Capital City Median	**$12,914**	**$1,544**	**$344,004**
Capital City High	$19,372	$2,316	$516,006
Rest of Australia low	$76	$112	$40,768
Rest of Australia Median	**$150**	**$225**	**$81,538**
Rest of Australia High	$226	$337	$122,306

Table 5.2: *Summary of unit cost of vehicle pollutants utilised in the derivation of forecast community health costs.*

The values cited in Table 5.2 were then utilised by the model to estimate the health costs of each segment of the national truck fleet in 2030. The result of this analysis is presented in Figure 5.4 below.

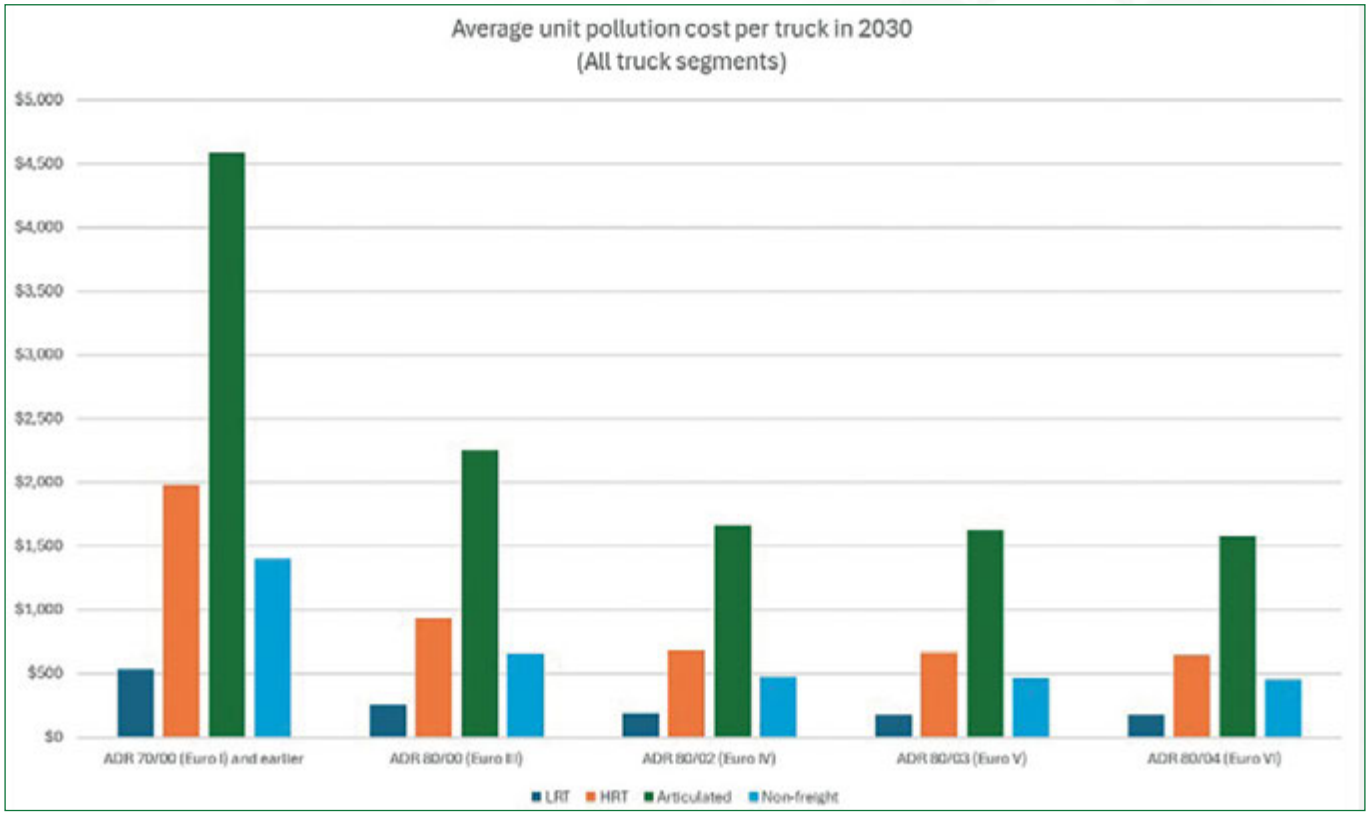


Figure 5.4: *Estimated unit pollution cost by fleet segment in 2030.*

Analysis of Figure 5.4 reveals that the estimated community health cost of an ADR70/00 (or earlier) truck will be between 301% (Non-freight truck) and 311% (Heavy Rigid Truck) higher than an equivalent ADR 80/04 truck in 2030. Articulated vehicles produce the highest emission cost overall.

The forecast annual community health cost of the operation of the national truck fleet is forecast to increase by an estimated $44M to $812M between 2025 and 2030 (See Figure 5.5). This will occur despite the introduction of the most stringent emission standard in Australia for the sale of all new trucks from 1 November 2025 (i.e. ADR 80/04).

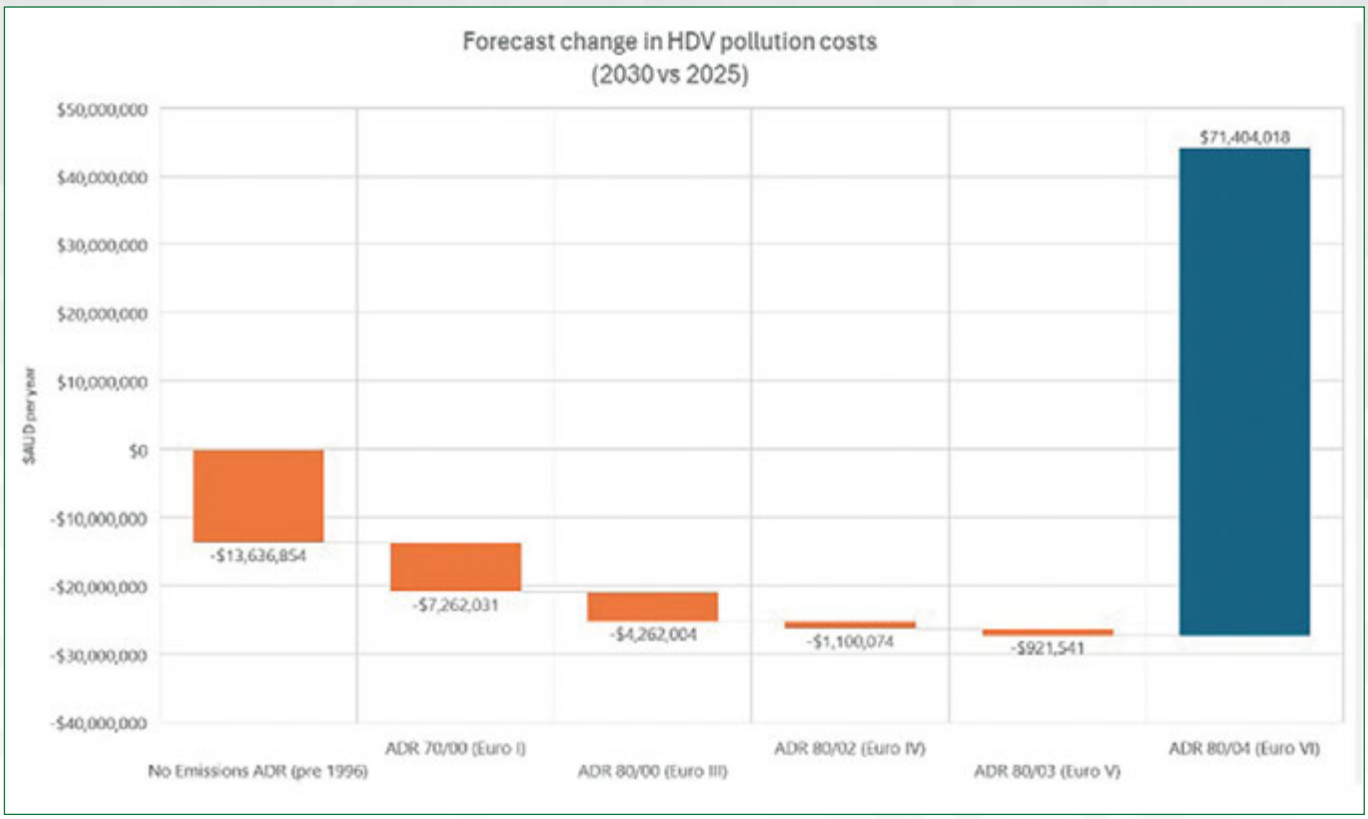


Figure 5.5: *The aggregate community health cost of the national truck fleet operation is forecast to increase between 2025 and 2030.*

Analysis of the likely truck fleet composition between 2025 and 2030 reveals that, despite the addition of an estimated 108,000 new ADR80/04 compliant trucks, the increase in overall community health costs is $44M due to the continued use of older emission vehicles within the fleet (see Figures 5.6 and 5.7).

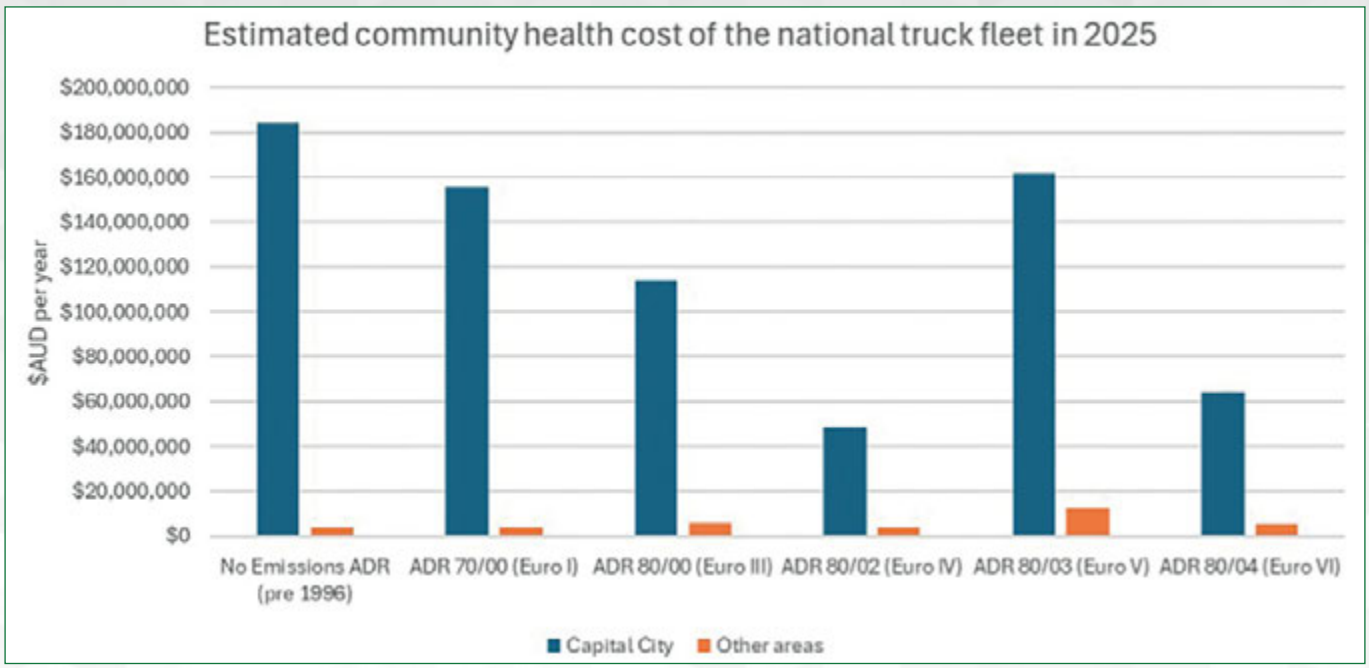


Figure 5.6: *Estimated annual community health cost of the national truck fleet (classified by emissions ADR) in 2025.*

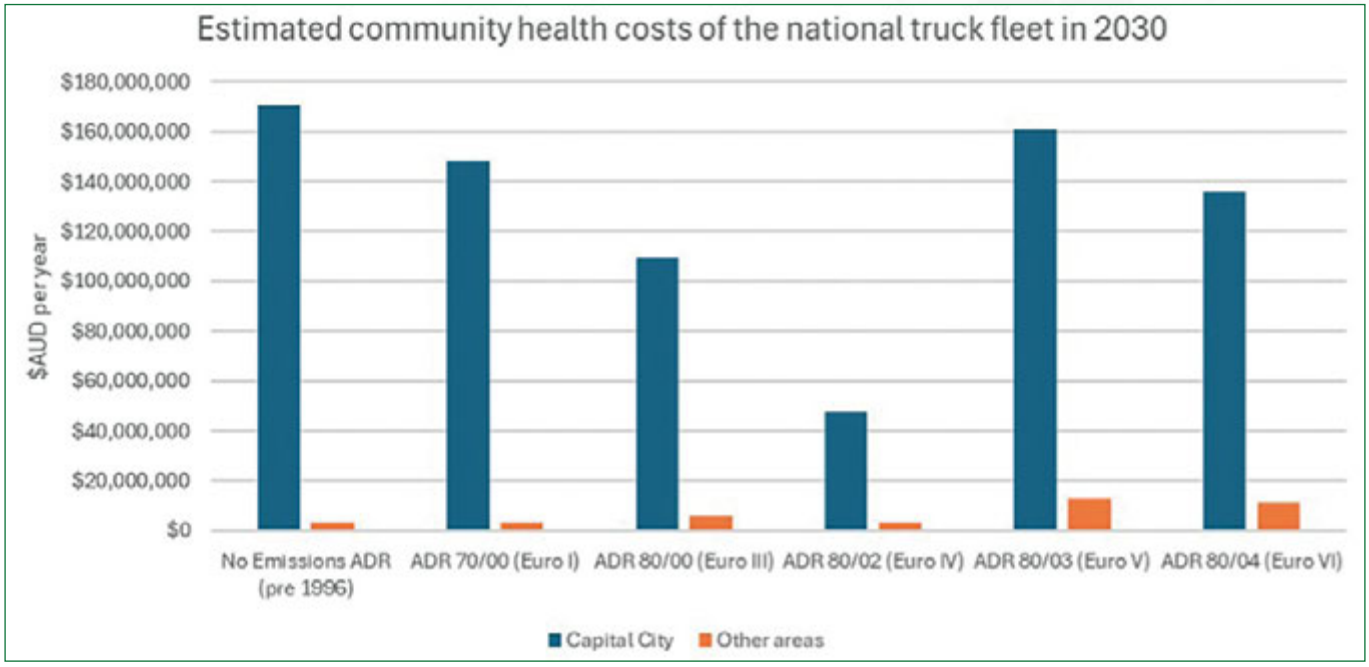


Figure 5.7: *Estimated annual community health cost of the national truck fleet (classified by emissions ADR) in 2030.*

When considered in aggregate, the community health cost of ADR80/00 vehicles and earlier will reduce only slightly from $453.5M in 2025 (i.e. 62% of the total fleet cost) to $428.3M in 2030 (i.e. 52.7% of the total fleet cost). In other words, the modest retirement rates of the national truck fleet are forecast to undermine the potential health benefits derived from the implementation of ADR80/04 for new models from 1 November 2024 (and all new trucks from 1 November 2025).

Significantly, maintenance of the annual community health costs of the national truck fleet at the 2025 level would require the replacement of 16,700 of the forecast 19,900 older articulated trucks (i.e. ADR70/00 or earlier) with new ADR80/04 trucks by 2030 – or 37,400 of the forecast 105,504 older heavy rigid trucks (i.e. ADR70 or earlier).

5. OPPORTUNITIES FOR REDUCED COMMUNITY HEALTH COSTS

It is suggested that there are three major opportunities to reduce growing community health costs associated with the operation of the national truck fleet, with a primary focus on reducing human exposure to truck emissions in Australia's highly populated capital cities. These opportunities include:

a) application of differential national vehicle registration charges,

b) introduction of low emission zones in highly populated areas that either prohibit access of, or charge for access by, older trucks, and

c) development of a National Fleet Renewal Program to reduce the growing number of older trucks operating in the national fleet.

5.1. Differential registration charges based on ADR (revenue neutral)

There appears to be a significant opportunity to introduce a tiered structure for the registration of trucks in Australia, albeit that this would require a coordinated national approach supported by all State and Territory Governments.

The principal motivation for this initiative would be to incentivise the replacement of the oldest trucks in the fleet by applying variable rates of registration that are based on the pollution production potential of individual trucks. Specifically, registration charges could be tiered according to the ADR emission standard that applied to the vehicle when it was manufactured and whether the vehicle is registered in a capital city or rural environment.

It is suggested that the registration tiers would be priced according to the quantum of differences in emissions production and would be revenue neutral. The following information could be used as the basis for the pricing regime.

- **Pre-1996 trucks:** It is estimated that 88,180 of these vehicles will still be in operation in 2030. The annual community health cost of these vehicles is assumed to be at least $174.3M per year in 2030 (Assuming equivalence with ADR 70/00 vehicles). These vehicles generate diesel emissions at a rate that is at least 320% higher than a Euro VI vehicle.
- **ADR70/00 (Euro I) trucks:** It is estimated that 75,438 of these vehicles will still be in operation in 2030, with an annual community health cost of $151.6M in 2030. These vehicles generate diesel emissions at an average rate that is 320% higher than a Euro VI vehicle.
- **ADR 80/00 (Euro III) trucks:** It is estimated that 114,783 of these vehicles will still be in operation in 2030, with an annual community health cost of $115.2M in 2030. These vehicles generate diesel emissions at an average rate that is 162% higher than a Euro VI vehicle.
- **ADR 80/02 (Euro IV) trucks:** It is estimated that 73,311 of these vehicles will be in operation in 2030, with an annual community health cost of $50.9M in 2030. These vehicles generate diesel emissions at an average rate that is 112% higher than a Euro VI vehicle.
- **ADR 80/03 (Euro V) trucks:** It is estimated that 265,041 of these vehicles will be in operation in 2030, with an annual community health cost of $173.4M in 2030. These vehicles generate diesel emissions at an average rate that is 105% higher than a Euro VI vehicle
- **ADR 80/04 (Euro VI) trucks:** It is estimated that 236,824 of these vehicles will be in operation in 2030, with an annual community health cost of $151.6M in 2030. These vehicles generate diesel emissions at an average rate at the most stringent emission standard for trucks sold in Australia.

Given the above analysis, it is suggested that a system of tiered registration charges could be developed around the unit emissions production rates of each class of truck relative to the most stringent emissions standard in the country. That is, the lowest registration charges being levied for ADR 80/04 trucks and the highest for ADR70/00 and pre-1996 trucks.

5.2. Introduction of low emission zones (LEZs) in highly populated areas of Australia's capital cities

A Low Emission Zone (LEZ) for trucks is a designated area where measures are implemented to restrict or penalise vehicles that produce higher levels of pollutants. The goal of LEZs is to improve air quality by encouraging the use of cleaner, more environmentally friendly vehicles. Key features of LEZs include:

- **Restrictions on Polluting Vehicles:** Trucks that do not meet specific emissions standards are restricted from entering the zone.
- **Emissions Standards:** Low emission zones typically require vehicles to meet certain emissions standards, such as Euro IV, Euro V, or Euro VI, which are European standards defining acceptable limits for exhaust emissions of new vehicles sold in EU and EEA member states.
- **Geographical/Infrastructure Boundaries:** LEZs are usually defined by clear geographical boundaries within cities or urban areas where air quality is a concern. LEZs could also be defined by road/tunnel/port infrastructure.
- **Fees and Penalties:** Reduced Government charges could be given to low and zero emission vehicles and ADR 80/04 diesel vehicles. Alternatively, vehicles that do not comply with the prescribed emissions standards may be required to pay a fee to enter the zone or may face fines if they enter without meeting the standards. Such charges would be in-line with the pollutants emitted by these higher polluting vehicles.
- **Exemptions and Incentives:** Some LEZs offer exemptions for certain types of vehicles (e.g., emergency vehicles, historic vehicles) and incentives for cleaner vehicles, such as electric trucks, to promote the adoption of low-emission technologies.
- **Monitoring and Enforcement:** Enforcement is typically carried out using automatic number plate recognition (ANPR) cameras, which monitor vehicles entering the zone and check their compliance against a database of registered vehicles.

Examples of cities with LEZs include London (Ultra Low Emission Zone - ULEZ), Paris (Zone à Faibles Émissions - ZFE), and Berlin (Umweltzone). These zones are part of broader efforts to reduce air pollution, protect public health, and meet environmental targets.

It is suggested that the Australian approach could involve the design of capital city LEZ's by the relevant State/Territory Governments, with the permit system administered by the NHVR in the same way that PBS approvals (and approved routes) are administered.

5.3. Fleet Renewal Financial Incentive Program

A fleet renewal financial incentive program is a government initiative designed to encourage the replacement of older, more polluting vehicles with newer, more efficient, and environmentally friendly vehicles. For trucks in Australia, such a program would aim to reduce emissions, improve air quality, and enhance the overall efficiency and safety of the transport sector.

The key feature of a fleet renewal financial incentive program can be summarised as follows:

- **Eligibility Criteria:**
  - The program would specify which trucks qualify for the finanial incentive, often targeting older models that emit higher levels of pollutants.
  - Criteria might include the age of the vehicle and its emissions standards.
- **Financial Incentive Amounts:**
  - Financial incentives would be offered to truck owners to offset the cost of purchasing new, cleaner vehicles.
  - The incentive amount could vary depending on the type of new vehicle being purchased, with higher incentives for electric or hybrid trucks.
  - Financial incentives would be offered to truck owners to offset the cost of purchasing cleaner, second hand, ADR 80/03 (Euro V) vehicles.
- **Application Process:**
  - Truck owners would need to apply for the financial incentive, providing documentation such as proof of ownership, details of the old truck, and a purchase agreement for the new vehicle.
  - Applications might be reviewed and approved by a designated government agency.
- **Retirement Requirement:**
  - To ensure the old trucks are permanently removed from the road, the program requires that the old vehicles be retired or otherwise decommissioned.
  - This ensures that the environmental benefits of the program are realised.
- **Compliance and Monitoring:**
  - The program would include mechanisms for monitoring compliance, ensuring that the new vehicles meet specified emissions standards and are properly maintained.

There are a number of international examples of these programs in operation. These examples include:

- **United States - Diesel Emissions Reduction Act (DERA):**
  - Provides funding for programs that reduce diesel emissions, including grants for fleet renewal..
  - Encourages the replacement of older diesel trucks with newer, cleaner models.
- **European Union - Various Member State Programs:**
  - Countries like Germany and the Netherlands have implemented scrappage schemes and incentives to promote the adoption of low-emission vehicles.
  - These programs often provide substantial financial incentives for scrapping old vehicles and purchasing new, cleaner ones.
- **United Kingdom - Plug-in Truck Grant:**
  - Offers grants for the purchase of new low-emission trucks.
  - The program is part of a broader strategy to reduce emissions from the transport sector and promote electric vehicles.

In summary, a fleet renewal program for trucks in Australia would involve financial incentives to encourage the replacement of old, high-emission vehicles with new or used late model, cleaner vehicles.

While the costs of such a program are likely to be substantial from a government perspective, they could be targeted at the oldest high polluting trucks yielding the following total annual savings from 2030 in terms of 70% effectiveness of retirement over the next 5 years:

The key feature of a fleet renewal financial incentive program can be summarised as follows:

- **Retirement of Pre 1996 trucks**: Annual savings of $122.0M
- **Retirement of ADR70/00 trucks**: Annual savings of $106.1M
- **Retirement of ADR 80/00 vehicles**: Annual savings of $80.6M

In other words, such a program could be designed around the realisation of total annual community health savings of $308.7M per year.

6. SUMMARY OF KEY INSIGHTS

The discussion presented in this chapter gives rise to the following observations in respect of the annual community health costs associated with the operation of the national truck fleet to 2030.

1. The national truck fleet is forecast to grow by 108,000 units to 853,000 trucks between 2025 and 2030.
2. The total number of trucks *more than 23 years of age* will increase by 92,278 trucks (or 49%) to an estimated 278,278 trucks between 2020 and 2030. Approximately 163,000 of these trucks will be *more than 27 years old*, suggesting that the continued use of older trucks is undermining the projected community health benefits of developments in Australia's emissions ADRs for trucks.
3. The forecast annual community health cost of the operation of the national truck fleet is forecast to increase by an estimated $44M to $812M between 2025 and 2030. This will occur despite the introduction of the most stringent emission standard in Australia for the sale of all new trucks from 1 November 2025 (i.e. ADR 80/04).
4. There are three possible strategies for the reduction of the community health costs associated with the operation of the national truck fleet. These strategies can be summarised as follows:
    a. Differential registration charges based on ADR emissions compliance level.
    b. Introduction of low emissions zones in highly populated areas of Australia's capital cities.
    c. Implementation of a Fleet Renewal Financial Incentive Program.

Chapter 6: Modernising the Australian Truck Fleet - Policy Recommendations

There is no one specific 'silver bullet'; a suite of approaches will need to be employed to modernise the Australian Truck Fleet and assist Government to achieve its strategic objectives. These approaches will result in improved safety for all road users, reduced carbon and harmful noxious emissions for a given freight task, enhanced energy productivity and improved economic performance. By doing so, the Government's Ambition can meet Industry's Reality.

Policy recommendations to modernise the nation's truck fleet making significant road safety, health, environmental, productivity and economic gains include:

Financial Incentives

- Accelerate the introduction of safer, greener, cleaner technologies by encouraging the purchase of low and zero emission trucks through the provision of:
    - o A 100% instant asset write off depreciation allowance that offsets the costs associated with the purchase of a new low and zero emission truck; and a new ADR 80/04 (Euro VI and equivalent) diesel only truck.
    - o Acknowledging that some operators will not be in a position to purchase new vehicles, the government should provide 50% depreciation allowance towards the purchase of used ADR 80/03 (Euro V and equivalent) emissions compliant trucks if upgrading from an ADR 80/02 or prior emissions level vehicle.

Regulatory Incentives

- National Cabinet to work towards providing uniformly green vehicle rebates and reducing federal and state taxes (registration charges and stamp duty) for low and zero emission trucks and ADR 80/04 (Euro VI and equivalent) diesel powered truck.
- National Cabinet to work towards uniformity agreeing and implementing measures, across all jurisdictions, that offset the operator's payload loss of a new low and zero emission truck, by allowing higher axle masses to restore parity with similar size internal combustion vehicles maintaining operator productivity.
- National Cabinet to review Australia's unique heavy vehicle mass and dimensional (Length) regulations by pursuing regulation change as an agenda item within the *National Road Safety Strategy 2021-2030*, to align with international standards.
- National Cabinet to implement a Road User Charge (RUC) for operators based upon the principal of all vehicles paying proportionally for the damage, or lack thereof, that they contribute to our roads, the safety they afford all road users, the public health outcomes they generate and the carbon emissions that they produce.
- National Cabinet to remove regulatory and infrastructure barriers preventing the uptake of Higher Productivity Vehicles, for example, B-triple, A-double, and Performance Based Standards (PBS) heavy vehicle combinations, in combination with the uptake of specific vehicle advanced safety features and to further incentivise the transition from semi-trailer to B-double combinations, by reducing registration charges for B-double vehicles with advanced safety features.
- The Federal Government should implement policies that stimulate the provision of key infrastructure necessary for the transition and uptake of low and zero emission heavy vehicles, for example, the provision of public electric vehicle infrastructure that is suitable for use by heavy vehicles, improve the national electrical grid infrastructure capacity and fast-tracking infrastructure to facilitate the manufacture and distribution of green hydrogen.

- State and Territory Governments should create low emission zones as defined by road/tunnel/port infrastructure or geographical parameters preferencing low and zero emission vehicles and ADR 80/04 diesel vehicles with reduced government charges such as road tolls. Alternatively, increased toll charges and/or emission zone fees for pre-2011 vehicles with poor noxious emission performance. Such charges should be in-line with the pollutants emitted by these higher polluting vehicles.
- The National Heavy Vehicle Regulator (NHVR), State and Territory Governments to mandate annual safety/ roadworthiness and environmental inspection/test scheme for all heavy vehicles over one (1) year old.
- State and Federal Governments to facilitate the start of evaluation trials for trailers with traction eAxles, by amending regulations are required.

Low Carbon Liquid Fuel Incentives

- The Federal Government should as a matter of urgency introduce capital and production financial incentives to foster the development of an Australian low carbon, liquid fuel industry production capacity.
- The Federal Government should immediately finalise the draft Paraffinic Diesel (Renewable Diesel) Standard.
- The Federal Government should expand the Guarantee of Origin Scheme to include LCLFs.
- The Federal Government should implement blending mandates for Bio-diesel, Renewable Diesel and SAF to be introduced concurrently on all three LCLFs and at a point in the fuel supply chain no later than the fuel wholesaler.
- The Federal Government should introduce measures that will achieve cost effective, high quality and consistent, LCLF/mineral diesel blends to support blend mandates by means of a volume blending regulation/system similar to that deployed in Europe.

Changing Behaviour Incentives

- Government to invest in a public awareness campaign with the objective being to change current undesired consumer and operator behaviours that result in more carbon emissions in favour of desired behaviours that pursue the objective of reduced emissions.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