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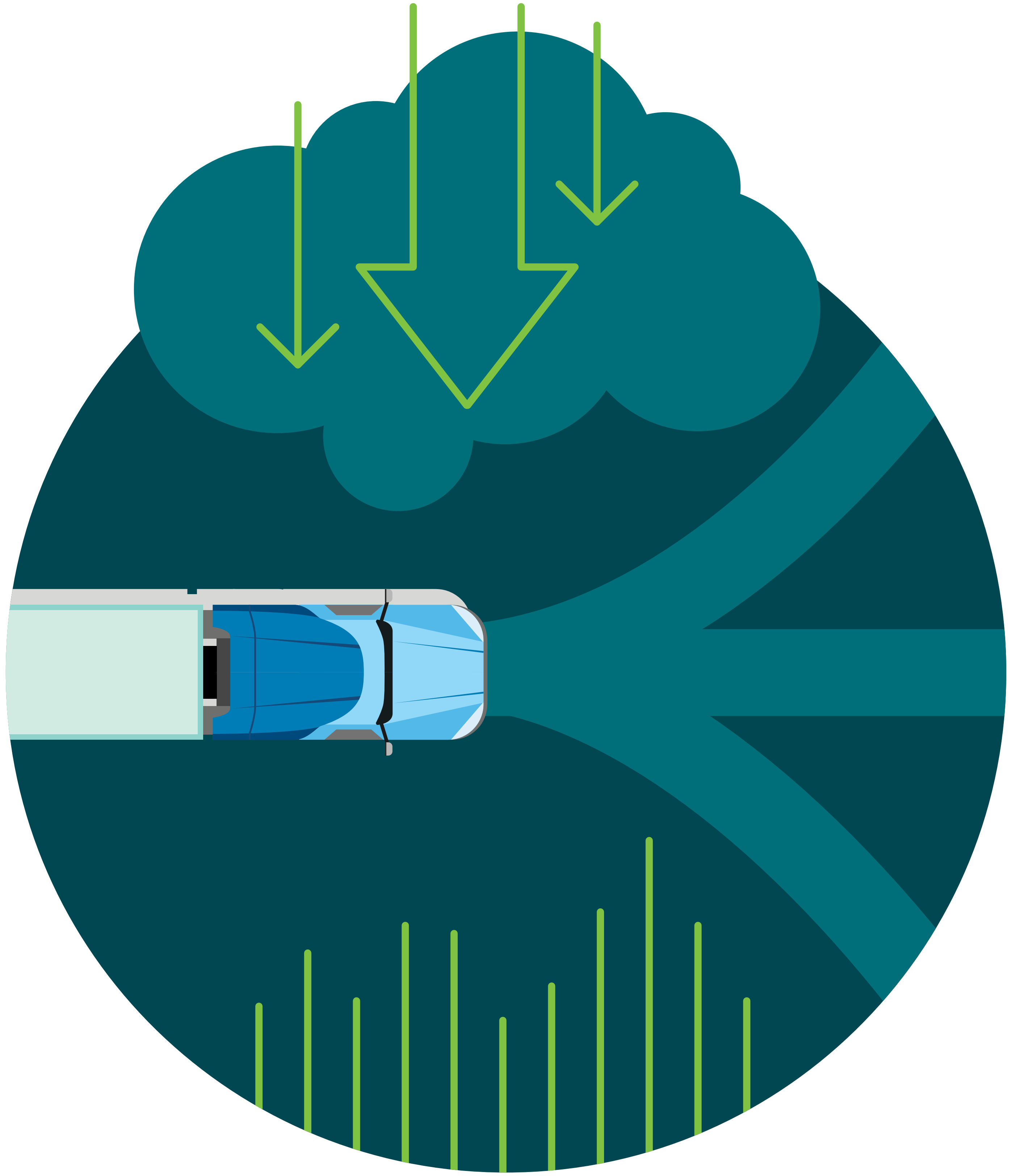


Emissions modelling and analysis

Australian Trucking Association (ATA)

April 2025

Deloitte
Access Economics

Contents

Executive summary

This report analyses strategic pathways to assist with the decarbonisation of Australia's trucking industry through developing an independent evidence-based trajectory for road freight transport's greenhouse gas (GHG) emissions. Deloitte Access Economics has independently reviewed Australian Trucking Association (ATA) policy positions, assessed, and modelled altered emissions paths as a result of the proposed policy. Research from Curtin University on *Business-as-Usual Road Freight Emissions*[1] was also used as a reference to guide the Deloitte modelling approach.

The Australian Government has a goal to reduce GHG emissions to 43% below 2005 levels by 2030 and achieve net zero emissions by 2050. Currently, the transport sector, like many others, is not on track to meet these targets. The ATA has proposed a set of policies which it considers are likely to be cost effective and achievable for industry which will help reduce emissions. This report therefore focuses on how the proposed ATA policies could help to accelerate the current anticipated emissions reduction trajectory for the trucking industry.

In this report, the emissions reductions have been modelled to come from three primary interventions: a purchase voucher scheme for electric vehicles, incentives for renewable diesel production, and a $5 billion investment in targeted road upgrades with access improvements and funding for eight critical road projects (road upgrades).

01

Purchase voucher scheme

This scheme would subsidise 50% of the price difference between electric and conventional trucks, starting in 2026 for both rigid and articulated trucks. The ATA has proposed this scheme to make electric trucks more financially accessible, accelerating their adoption and contributing significantly to emissions reductions by lowering the upfront cost of ownership.

02

Incentives for renewable diesel production

By supporting domestic renewable diesel to meet 5 per cent of Australia's diesel supply before the mid-2030s, this policy addresses the cost differential between renewable and conventional diesel.

CO_2-e

The modelling estimates that these policy measures could significantly assist with decarbonising Australia's trucking industry. Collectively, it is estimated that the purchase voucher scheme, renewable diesel incentives, and road upgrades could reduce total emissions by approximately 35.1 million tonnes of CO_2-e over 25 years. This equates to an estimated 9.3% reduction on the base case cumulative emissions trajectory for the sector. These policies not only aim to reduce emissions but also modernise the fleet, aligning with Australia's broader net zero goals and supporting economic growth within the trucking industry. These policies also align with clean air objectives by reducing particulate emissions.

Overall, the proposed policies can be significant in facilitating Australia's net zero transformation in a manner that is realistic and achievable. Each intervention accelerates the Australian trucking industry's ability to meet the government's national 2030 emissions target of reducing GHG emissions to 43% below 2005 levels, with the combined effect of interventions reaching the target in 2047, two years ahead of the base case.

03

$5 billion in targeted road upgrades with access improvements and funding for eight critical road projects

Commencing with construction in 2030, these upgrades will facilitate the use of high productivity vehicles and electric trucks by enhancing road infrastructure to support heavier payloads from 2026 onwards. This reduces vehicle kilometres travelled (VKT) and increases efficiency, thereby contributing to significant emissions reductions.

The combined measures are expected to cumulatively reduce emissions by

35.1 million tonnes of CO^2-e over 25 years

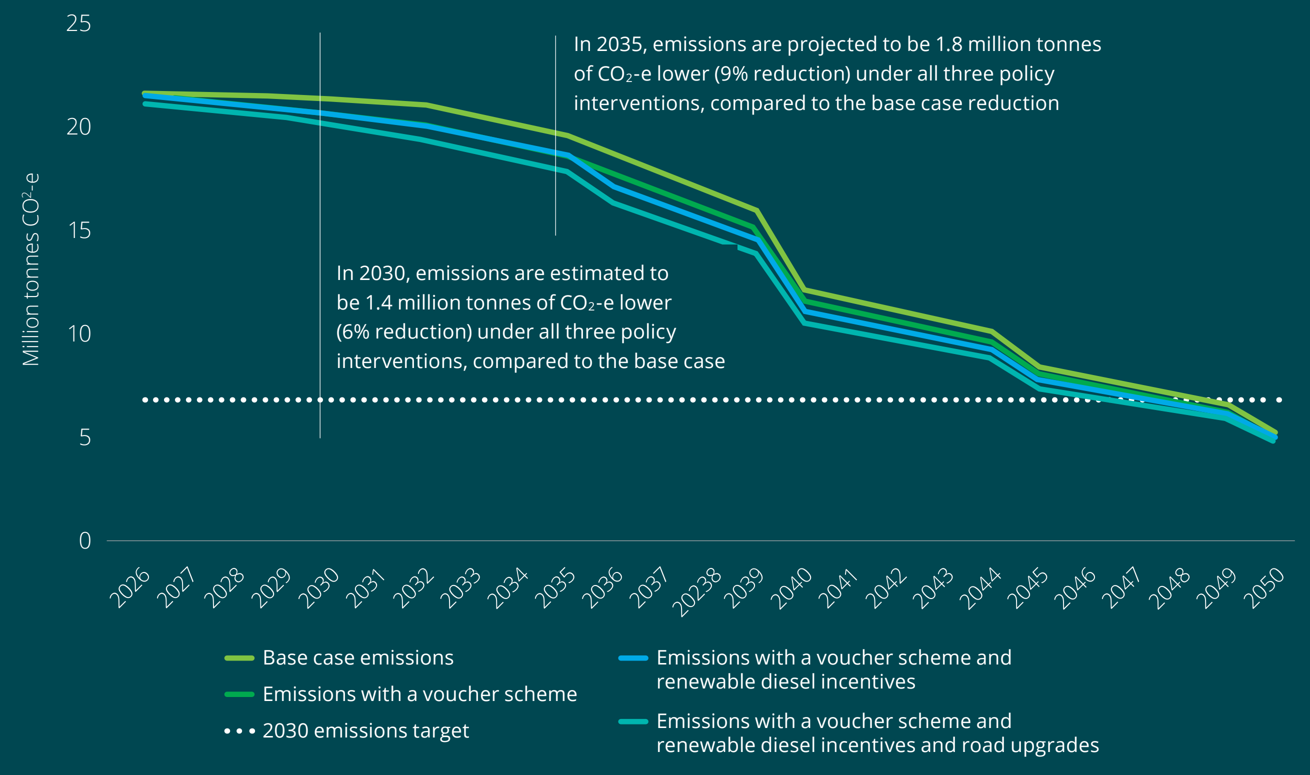
Key findings

Current state of the heavy vehicle freight sector

23%
of Australia's transport emissions were generated by the heavy vehicle sector in 2023, the second largest share after light vehicles

92%
of the domestic freight task is fuelled by diesel

25.8t
is the average payload of articulated trucks in 2020



Source: Deloitte Access Economics

Three ATA-proposed pathways to reducing emissions

A purchase voucher scheme is expected to reduce emissions by 14.9 million tonnes of CO_2-e by 2050.

Incentives for renewable diesel production are expected to reduce emissions by 6.9 million tonnes of CO_2-e by 2050.

$5 billion in targeted road upgrades and funding for eight critical road projects is expected to reduce emissions by 13.3 million tonnes of CO_2-e by 2050.

The three proposed ATA policy interventions are estimated to reduce emissions by a cumulative

35.1 million
tonnes of CO^2-e over 25 years,
helping realise the emissions target 2 years ahead of the base case.

1 Background

1.1 Purpose

The Australian Government (the government) has a goal to reduce GHG emissions to 43% below 2005 levels by 2030 and achieve net zero emissions by 2050. Transport is becoming increasingly important in achieving these goals as Australia's transport sector is the third largest source of Australia's GHG emissions, with heavy vehicle sector accounting for 23% of national transport emissions in 2023.[2]

As a result, government policy is becoming more active in reducing these emissions, such as through the Future Made in Australia Act which marks a strategic move to support the growth of new industries that benefit communities and workers, with a particular focus on low carbon liquid fuels (LCLF). Additionally, the government has released their Transport and Infrastructure Net Zero Consultation Roadmap.

The Government is seeking informed views from industry to understand how a LCLF industry can modernise Australia's truck fleet to support Australia's net zero transformation, leverage competitive advantage in Australian domestic LCLF production, and align economic incentives with national interest. This should be supported by realistic transition agreements. The ATA has been engaged in two submissions on low carbon liquid fuels and the net zero roadmap and has identified options which it believes are cost effective and achievable for the industry.

In particular, the hard-to-electrify transportation sectors, like long-haul trucking, have few established low-carbon technology solutions. Even with significant efforts to reduce passenger travel growth, a transition to mass transit, improvements in efficiency, and widespread adoption of electric and hydrogen vehicles, there will still be a substantial demand for dense liquid fuels until 2075. As a result, appropriate action is needed to modernise Australia's truck fleet through encouraging take up of low-emission fuel vehicles such as electric or hydrogen, reduce noxious emission, and supporting renewable diesel as a transitional fuel.

Deloitte has been engaged to develop a public report outlining an evidence-based trajectory for road freight transport's GHG emissions. This has been used to assess how three ATA-proposed policies could assist with the decarbonisation of Australia's trucking industry.

1.2 Approach

By leveraging our in-house models and publicly available data, Deloitte has developed a projected trajectory for road freight GHG emissions, encompassing both light and heavy trucks, conducted under a business-as-usual scenario. Where possible, we have reviewed and aligned modelling assumptions with external government sources such as AEMO and CSIRO, as well as using research from Curtain University to guide the Deloitte modelling approach.

The policy recommendations from ATA's submissions were assessed and used to model the impact of the key recommendations to the uptake of low-emission fuel (LCLF) vehicles across three scenarios: low, medium, and high adoption scenario as the "policy" case. The analysis considers the trade-offs between benefits and costs, to develop a realistic view of the potential uptake of different emission reduction approaches. The emissions profile of the three scenarios was used to estimate the impact of each ATA-proposed policy's emissions trajectory. The source of any uncertainties associated with the projection and modelling process has been noted and sensitivity tests of assumptions, where applicable, have been incorporated. Assumptions, input drivers, and any notable issues that might impact the emission trajectory in each of the scenarios have been summarised.

1.3 Baseline emissions projection

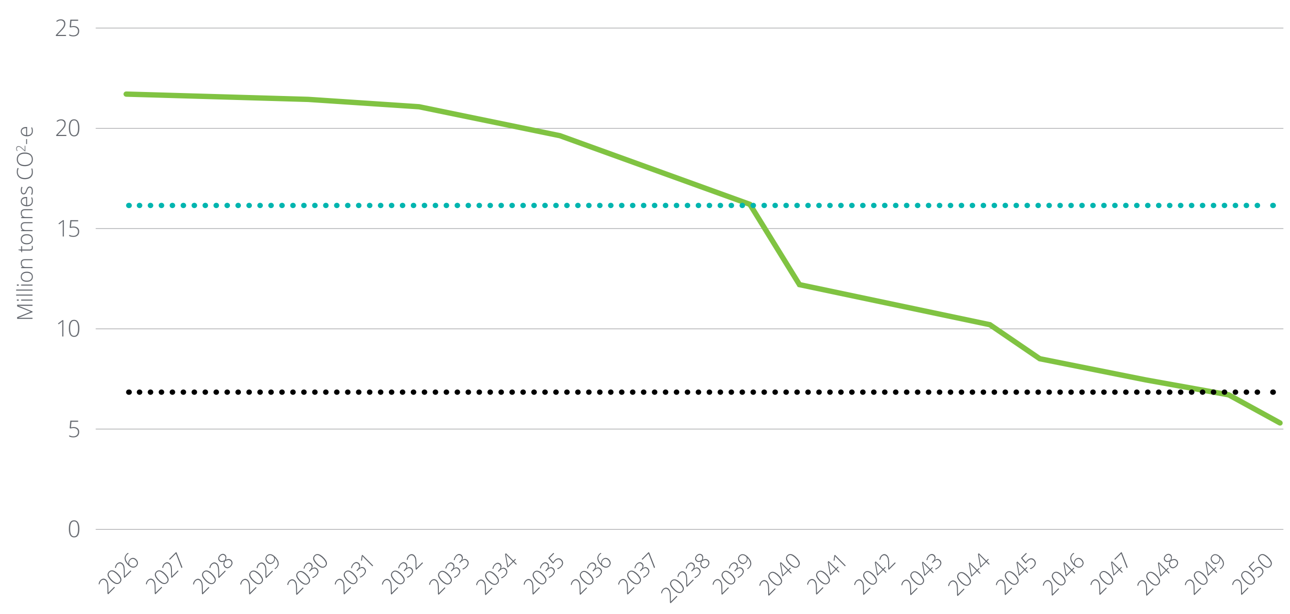
The Australian Government has made a formal agreement to reduce GHG emissions. These commitments include specific targets to lower emissions to 43% below 2005 levels by 2030 and achieve net zero emissions by 2050. GHG emissions in the transport sector have increased by 19%[3] since 2005, and by 2030 transport is expected to be the leading contributor to emissions in Australia.

In the base case, we project emissions will reach the 2030 target levels in 2049 and hence, the transport sector is currently not on track to meet these targets. In fact, emissions have grown from 2005 levels due to growth in the size of the national freight task. Emissions in 2026 are projected to be 22.6 million tonnes of $C0_2$-e, 2.5 times the target set in 2005.

From here, we project a long and slow decline in emissions under the base case to reach 5.2 million tonnes in 2050. The projected declines in the 2040s is largely driven by the anticipated shift in fuel sources from diesel towards electric and hydrogen in the late 2030s. This baseline projection has been largely informed by modelling from AEMO and CSIRO with some adjustments to match other analysis by Deloitte Access Economics, alongside emissions modelling produced by research from Curtin University.

However, even with the projected adoption of alternative fuel sources, we do not anticipate that the 2030 target of reducing emissions to 6.9 million tonnes, nor the net zero target by 2050 can be realised under current policy settings.

Chart 1.1: Emission profile under base case



Source: Deloitte Access Economics

Base case emissions
2030 emissions target
Heavy road freight emissions in 2005

2 Pathways to emission reduction

This section proposes three pathways to reducing emissions: a voucher scheme to subsidise the purchase of electric trucks, incentives for renewable diesel production and investment in road infrastructure.

2.1 Purchase voucher scheme

2.1.1 Overview

The proposed purchase voucher scheme addresses the price gap between electric and conventional trucks through a 50% subsidy on the price difference. This approach makes electric trucks more financially accessible to fleet owners, with subsidies distributed via dealerships to streamline the process. Under this policy, it is assumed that both rigid and articulated trucks become eligible for subsidies from 2026. By bridging the cost barrier, the scheme aims to accelerate the transition to zero-emission trucks in Australia's road freight sector.

2.1.2 Effect on emissions

In helping operators adopt electric trucks earlier and in larger volumes, this scheme could contribute significantly to overall emissions reductions.

2.1.3 Modelling approach

Electric truck uptake was estimated using a piecewise function that reflects staged, realistic adoption patterns. Price relativities are drawn from AEMO's Integrated System Plan (ISP)[4] forecasts, ensuring that the model aligns with prevailing market expectations. The subsidy is assumed to continue until electric trucks become sufficiently competitive that no additional financial incentive is required. Within the broader modelling framework, the purchase voucher scheme interacts with baseline forecasts by lowering the upfront cost of ownership for electric trucks. This increases the share of electric trucks in the medium and long term, ultimately reducing diesel consumption and related emissions.

2.2 Incentives for renewable diesel production

2.2.1 Overview

This proposed ATA policy supports domestic renewable diesel production to achieve 5 percent of Australia's diesel supply by the mid-2030s. By providing incentives for producers, the program addresses the cost differential between renewable diesel and conventional diesel. Because renewable diesel is a like-for-like fuel which can be used interchangeably with conventional diesel,[5] it is assumed that fleets can adopt it immediately with no additional engine modification requirements. The incentive for renewable diesel is additional to the purchase voucher scheme which means the fuel mix in the policy case differs from current forecasts. The base case fuel mix has been aligned with AEMO's ISP modelling.

The modelling estimates that emissions could decline relatively quickly once renewable diesel enters the market because it can directly replace conventional diesel. The renewable diesel incentives, when combined with the purchase voucher scheme, shifts the overall fuel mix further from diesel and places the sector on a more rapid decarbonisation path.

2.2.2 Modelling approach

Base fuel demand follows AEMO's ISP assumptions, and the introduction of renewable diesel is layered on top of the electric truck uptake induced by the purchase voucher scheme. Because renewable diesel is fully compatible with existing engines, its adoption curve is not limited by hardware changes; the primary driver is policy support and cost competitiveness. Incremental changes in the fuel mix are applied from the point of the incentive's introduction until domestic renewable diesel production reaches 5 per cent of Australia's diesel supply. After that milestone, renewable diesel remains available at scale, resulting in a sustained emissions benefit over the full 25-year modelling period.

2.3 $5 billion investment in targeted road upgrades with access improvements and funding for eight critical road projects

2.3.1 Overview

This ATA proposed initiative assumes $5 billion in Australian Government investment over ten years to upgrade roads so they can accommodate heavier, high productivity vehicles (HPVs) and electric trucks, as well as funding for eight critical road projects. The improved infrastructure lowers barriers to utilising trucks with greater payload capacity, which reduces the number of trips needed to move a given amount of freight, which can significantly reduce vehicle kilometres travelled (VKT). The increase in average payload is greater for articulated trucks than rigid trucks so they account for most of the effect on emissions. Additionally, there will be an overall increase in general mass likely to be allowed on the road (due to the HVNL changes), as well as an increase in electric trucks, further reducing emissions.

2.3.2 Modelling approach

The modelling uses payload data from NHVR (National Heavy Vehicle Regulator) and Deloitte's in-house models to estimate how improved roads enable higher-capacity vehicles. These calculations factor in the reduced trips, fuel use, and emissions resulting from lower total VKT, compared to the base case of no policy change.

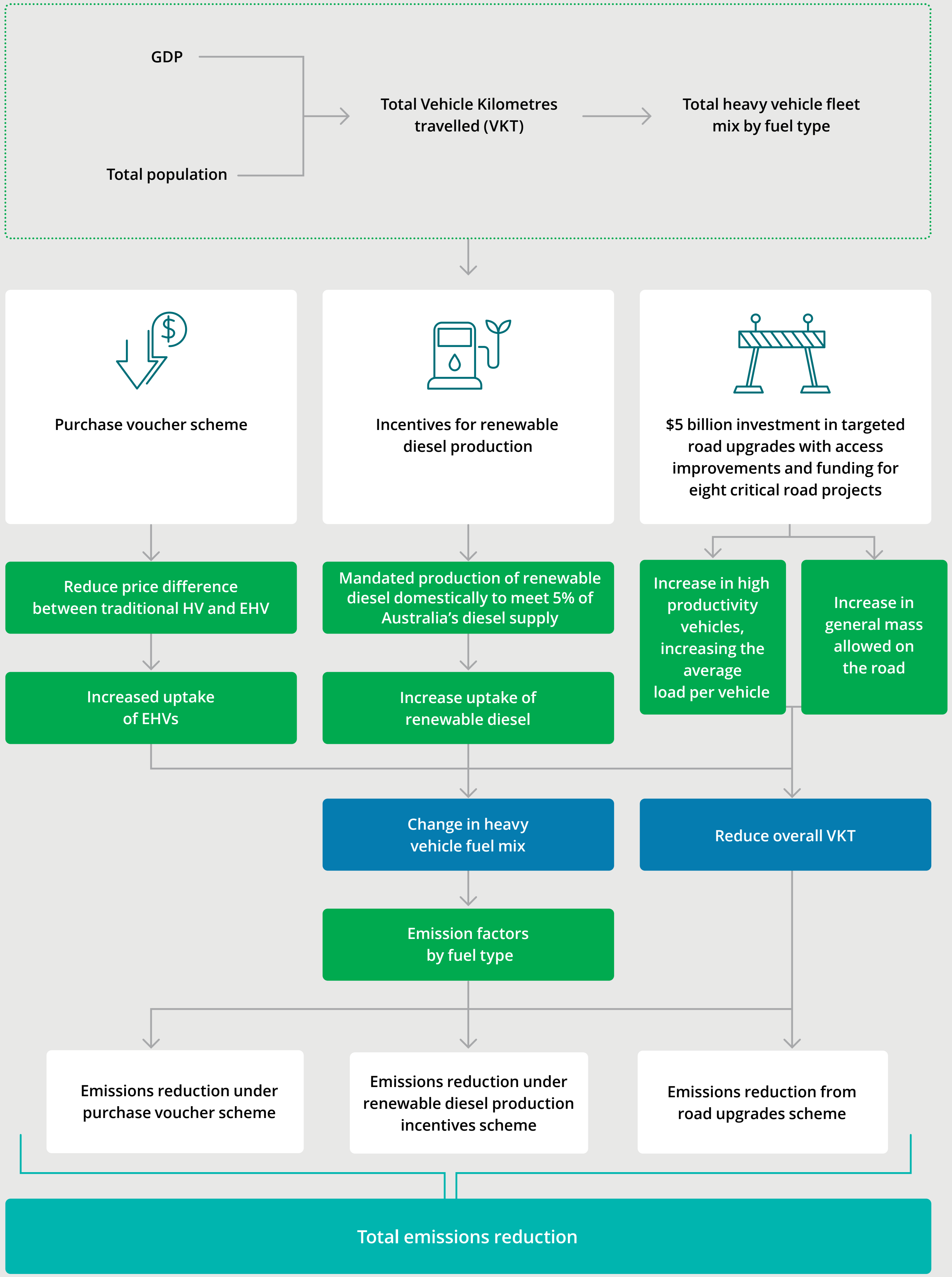
In the modelling, it is assumed that roads capable of supporting heavier trucks, with full upgrades, gradually enter the network over a ten-year window. The approach also incorporates the general mass limit (GML) to concessional mass limit (CML) increase expected under the Heavy Vehicle National Law (HVNL) review process, which is expected to take effect from 2026. Post-upgrades to the network, any fleet operator with appropriate vehicles can capitalise on the new infrastructure's increased capacity, generating ongoing emissions savings into the longer term. This approach is consistent with Deloitte's 2019 report for ATA, as well as using guidance from Curtin University's report on Business-as-Usual Road Freight Emissions.

Overall, each of these three policy pathways—voucher scheme, renewable diesel incentives, and road upgrades—contribute to a cumulative emissions savings of

35.1 million tonnes of CO_2-e over 25 years,

representing a 9.3% reduction in cumulative emissions (over 25 years) relative to the base case without the ATA-proposed policies in place. This brings forward the Australian trucking industry's ability to meet the government's road freight 2030 emissions target 2 years earlier compared to the base case, with the combined effect of interventions helping reach the target by 2047.

Modelling framework summary



Source: Deloitte Access Economics

3 Findings

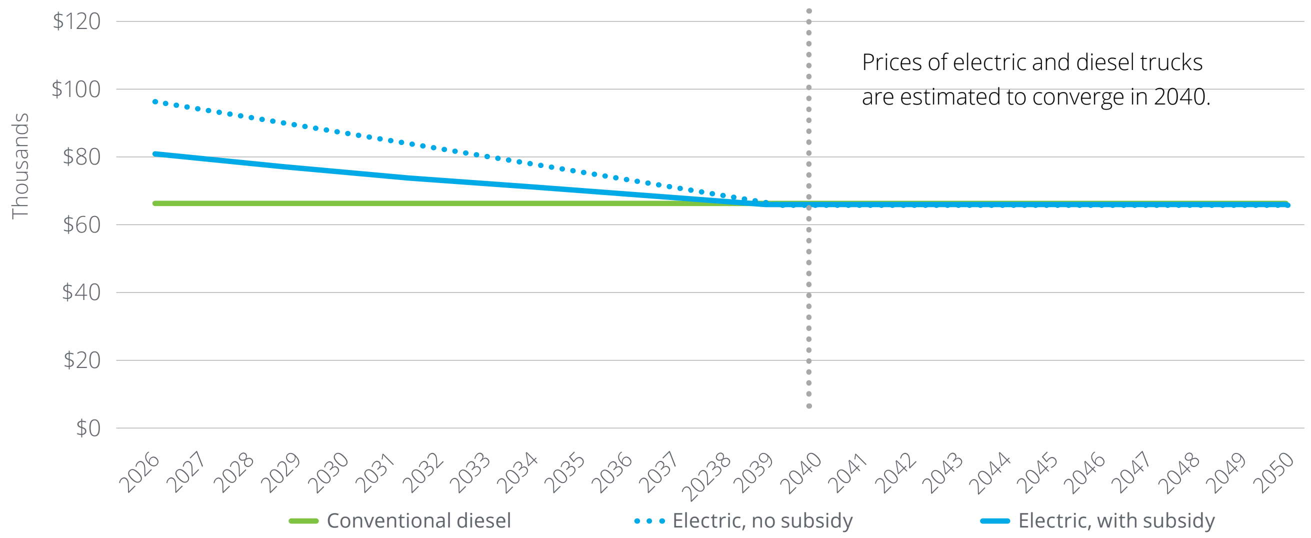
The three proposed schemes are estimated to reduce emissions by a cumulative 35.1 million tonnes by 2050. This means the Australian Government can reach its 2030 emissions target in 2047, two years ahead of the base case.

3.1 Purchase voucher scheme

3.1.1 Key assumptions

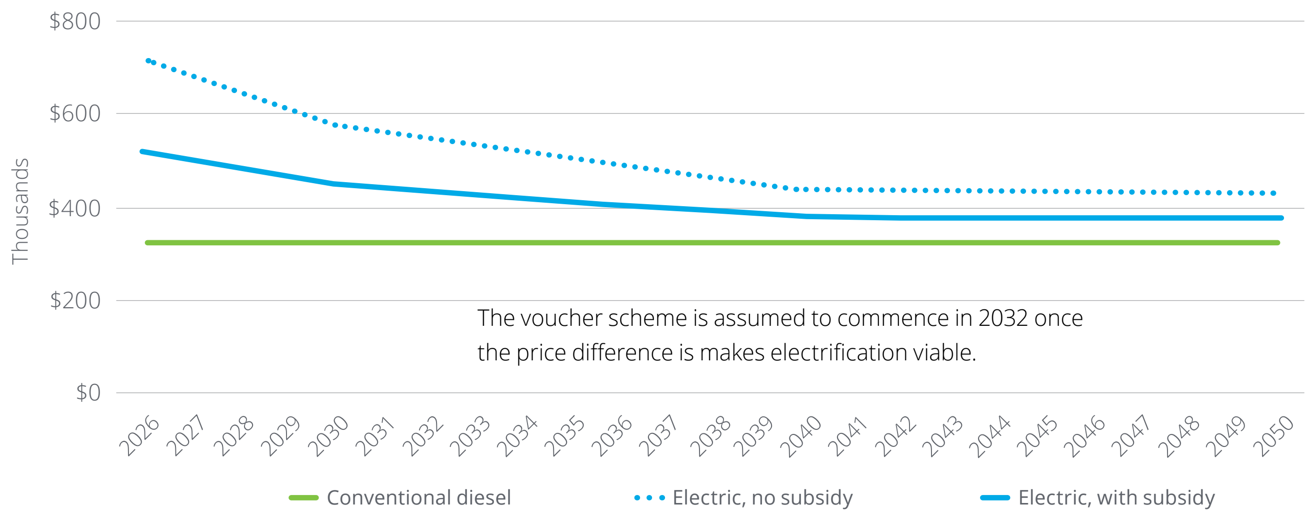
The ATA-proposed scheme subsidises 50% of the price difference between electric and conventional diesel truck models, distributed via dealerships. For the modelling, it is assumed that the subsidies will start in 2026 for both rigid and articulated trucks. The price differential (electric vs conventional) for rigid trucks is relatively moderate, whereas the price differential for articulated trucks (electric vs conventional) are significant. Hence, the initial uptake of articulated trucks under the purchase voucher scheme is expected to be low but is projected to increase over time as the technology becomes more cost effective.

Chart 3.1: Forecast prices of electric and diesel rigid trucks with and without a 50% subsidy



Source: Deloitte analysis informed by AEMO's ISP modelling

Chart 3.2: Forecast prices of electric and diesel articulated trucks with and without a 50% subsidy



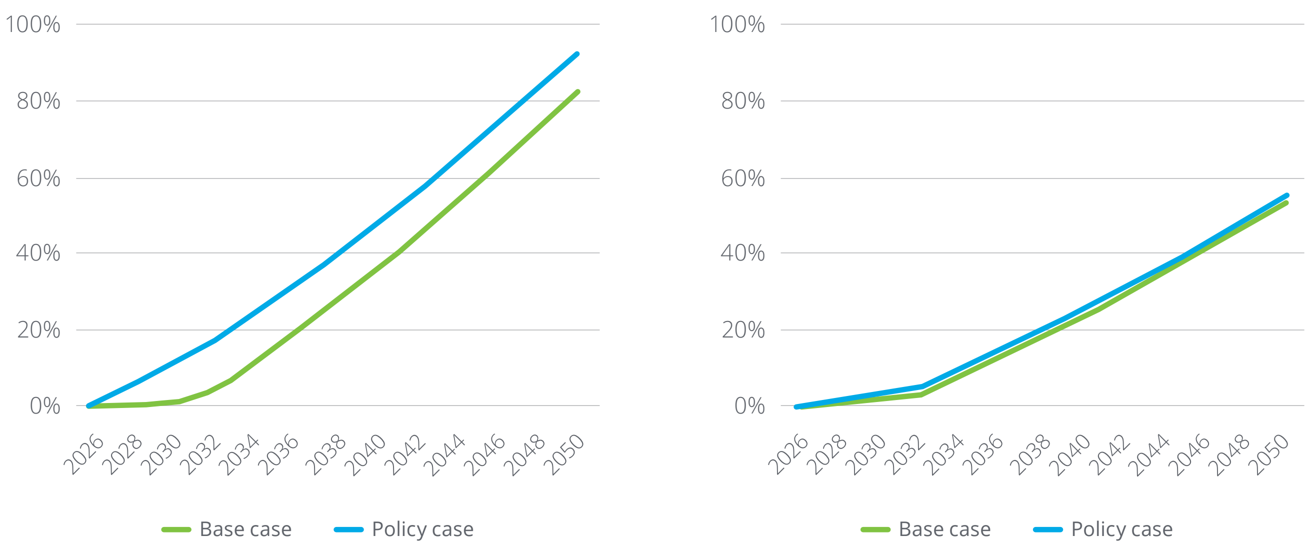
Source: Deloitte analysis informed by AEMO's ISP modelling

In the case of rigid trucks, we see that the prices of electric and diesel models are expected to converge in 2040 from a current price differential of $33,000. The prices of electric articulated trucks are expected to remain well above their diesel counterpart out to 2050, costing around $108,000 more in 2050 without a subsidy or $54,000 more with a 50% subsidy.

Electric truck uptake is modelled using a piecewise function designed to mimic previous modelling from CSIRO to reflect staged adoption. Relative prices are consistent with AEMO's ISP modelling.[6]

3.1.2 **Results**

Chart 3.3: Electric share of rigid truck fleet (left) and articulated truck fleet (right)



Source: Deloitte Access Economics

Under the purchase voucher scheme, the electric share of rigid trucks in the fleet increases significantly, reaching 92.2% in 2044, over 10 percentage points higher than in the base case. The electric share of articulated trucks is only 2 percentage points higher than the base case in 2050 under the policy case – this is due to the considerable price differential which remains even with a voucher scheme in place.

The purchase voucher scheme is expected to reduce emissions by 14.9 million tonnes of CO_2-e over 25 years. Most of this reduction is attributed savings from rigid truck purchases.

Chart 3.4: Cumulative emissions saved from the voucher scheme, 2026-2050

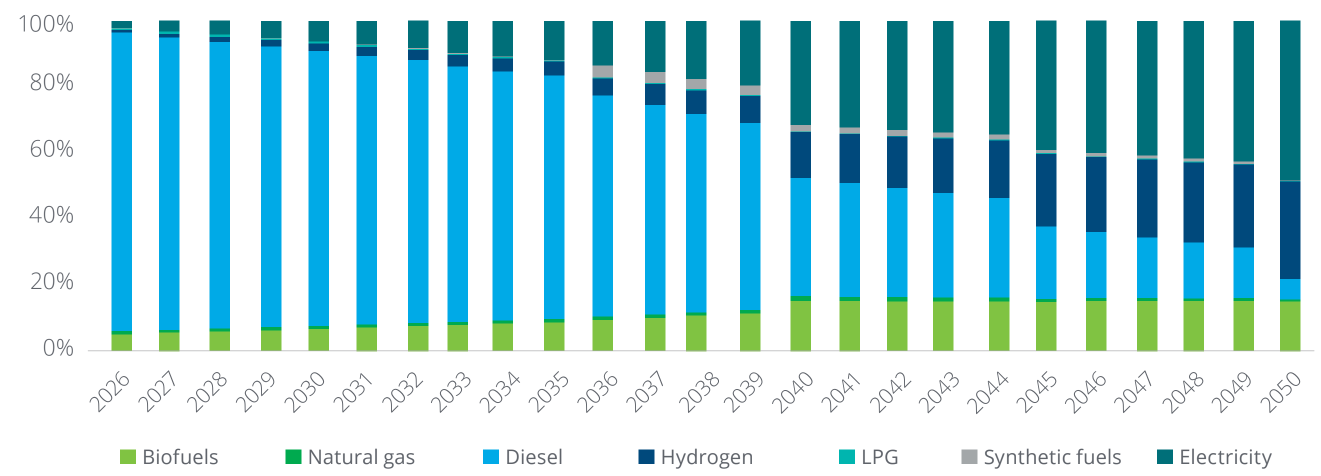
Source: Deloitte analysis informed by ATA modelling assumptions

3.2 **Incentives for renewable diesel production**

3.2.1 **Key assumptions**

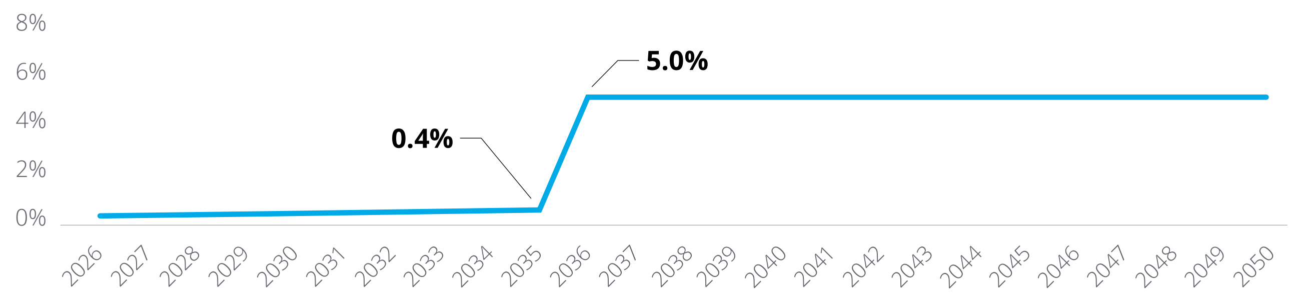
This policy involves incentives to produce enough renewable diesel domestically to meet 5 per cent of Australia's diesel supply before the end of the 2030s (2035 is assumed for the modelling). The base case fuel mix used is consistent with AEMO's ISP modelling. It should be noted that the incentives for renewable diesel are additional to the purchase voucher scheme which means the policy fuel mix differs from base case forecasts.

Chart 3.5: Overall fuel mix post renewable diesel incentives



Source: Deloitte analysis informed by CSIRO projections

Chart 3.6: Renewable share of diesel supply with incentives to increase production

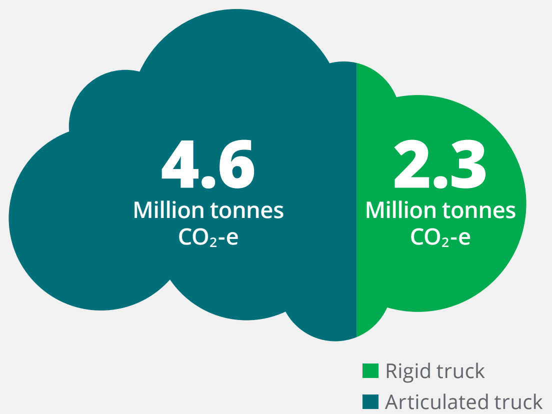


Source: Deloitte analysis informed by assumptions provided by ATA

It is assumed that 5% of the overall diesel supply in Australia will be renewable diesel from 2036 as a like-for-like replacement for conventional diesel. Once renewable diesel incentives are introduced, 5 percent of the conventional diesel share of the fuel mix is replaced by synthetic diesel. Diesel (conventional and synthetic) makes up 69.6% of the fuel mix in 2036, as shown in chart 3.5.

3.2.2 **Results**

Chart 3.7: Cumulative emissions savings from incentives for renewable diesel production, 2026-2050



Source: Deloitte analysis informed by ATA modelling assumptions

The incentives for renewable diesel production are projected to reduce emissions by a cumulative 6.9 million tonnes of CO_2-e over 25 years. Most of these savings consist of articulated trucks, which are expected to save 4.6 million tonnes of CO_2-e over this period.

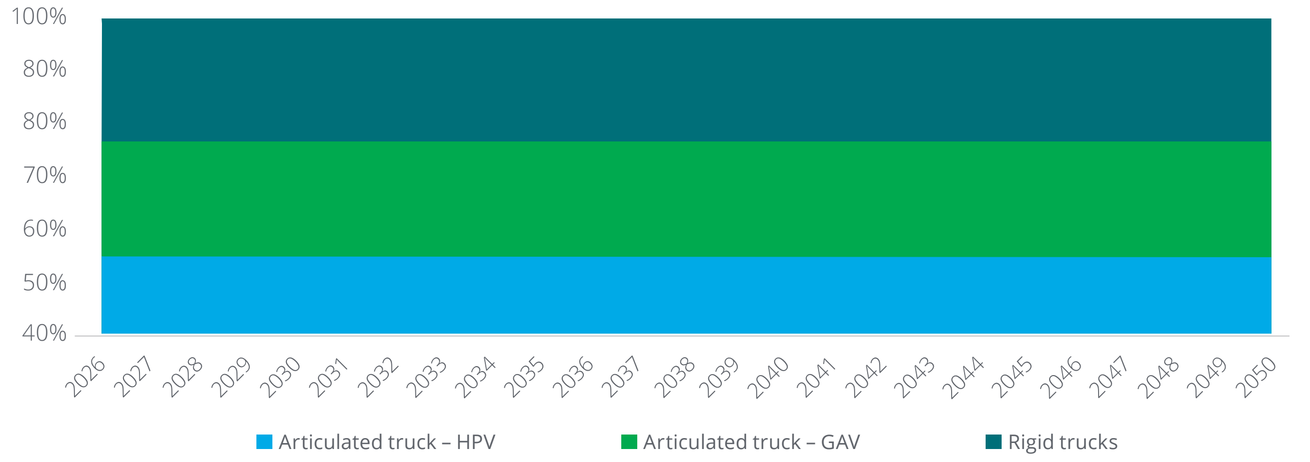
3.3 **$5 billion investment in targeted road upgrades with access improvements and funding for eight critical road projects**

3.3.1 **Key assumptions**

This ATA policy consists of $5 billion in Australian government investment (over ten years) in road upgrades to support high productivity vehicles (HPVs) and electric trucks, assumed to start in 2030, as well as funding for eight critical road projects. In addition, it is assumed that the HVNL reforms that enable CML will come into effect 2026 onwards. These interventions are expected to have two main impacts:

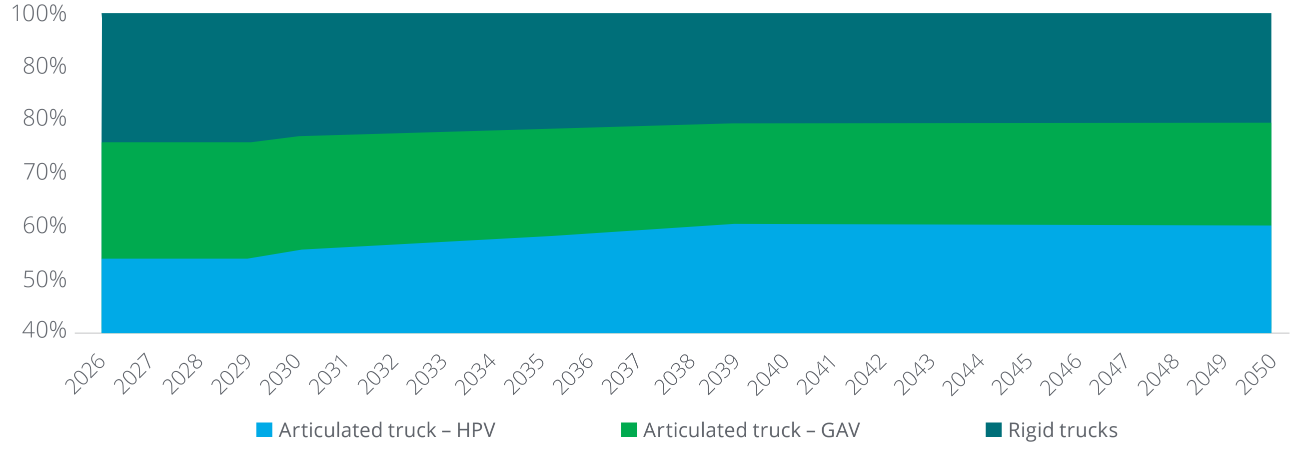
- **Initial Impact:** The network will be open to the increased use of HPVs and electric trucks. HPVs will be able to carry more cargo, thereby reducing the number of trips needed and vehicle kilometers travelled (VKT). This increased efficiency results in overall reductions in emissions across the network.
- **Secondary Impact:** There will also be an overall increase in the general mass likely to be allowed on the road, as a result of the HVNL Review (assumed to commence in 2026), leading to increased efficiency and additional reductions in VKT and emissions.

Chart 3.8: Vehicle mix by TKM- base case



Note: The Articulated truck – HPV category includes: A-Doubles, B-Doubles, B-triples and AB-triples
Source: Deloitte analysis informed by BITRE forecasts

Chart 3.9: Vehicle mix by TKM- policy case



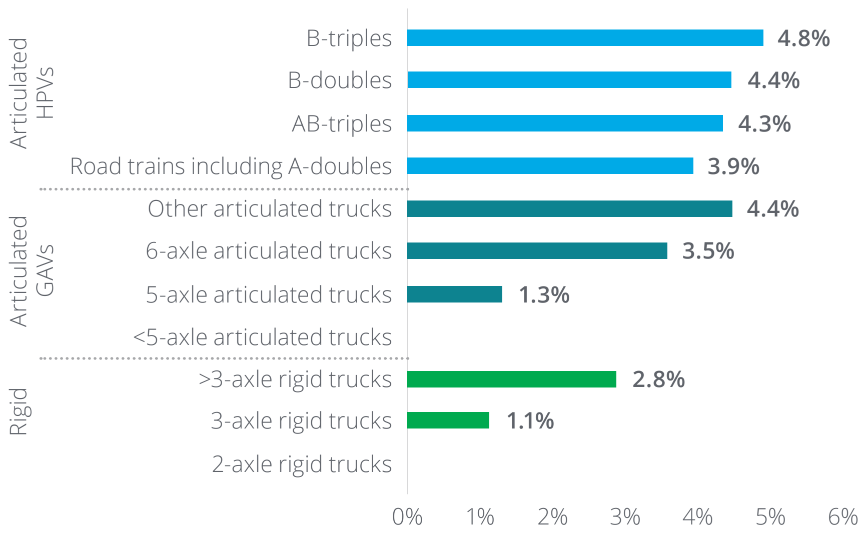
Note: The Articulated truck – HPV category includes: A-Doubles, B-Doubles, B-triples and AB-triples and all remaining articulated trucks are included under General Access Vehicles (GAV).
Source: Deloitte analysis informed by BITRE forecasts

Road upgrades, along key freight corridors, are estimated to lead to a slight increase in HPV uptake and a reduction in general access vehicles (GAV) and rigid trucks. This is aligned with the anticipated change from GML to CML under the HVNL review in 2026, which allows mass limits 5% higher than the GML. An increase in HPVs, such as A-doubles, reduces the number of trips needed for a given amount of freight, while using 72% of average fuel use,[7] resulting in increased efficiency and lower emissions. Road upgrades are essential for this to occur as they enable HPV to comply with their weight limits. Additionally, this policy can support the use of electric trucks further reducing emissions.

3.3.2 **Results**

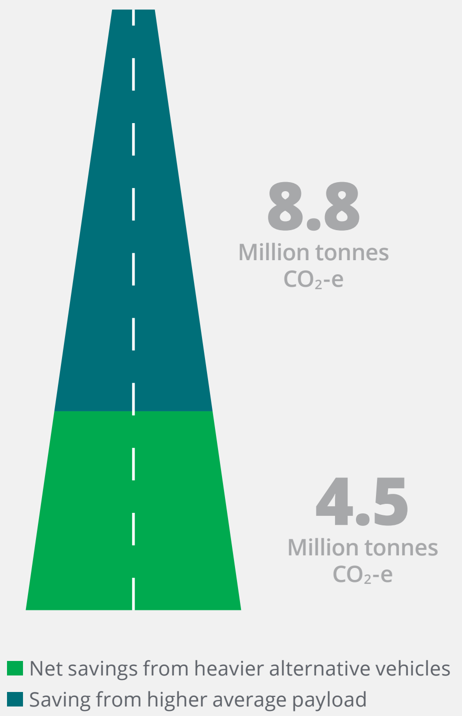
Chart 3.10 shows the estimated increase in average payload from the introduction of road upgrades. The largest increase can be attributed to the introduction of articulated HPVs into the national vehicle mix. These are the truck types which make up a smaller share of the existing fleet and are likely to be impacted the most from higher mass limits.

Chart 3.10: Percentage increase in average payload



Source: Deloitte analysis informed by assumptions from ABS and NHVR

Chart 3.11: Cumulative emissions savings from road upgrades, 2026-2050



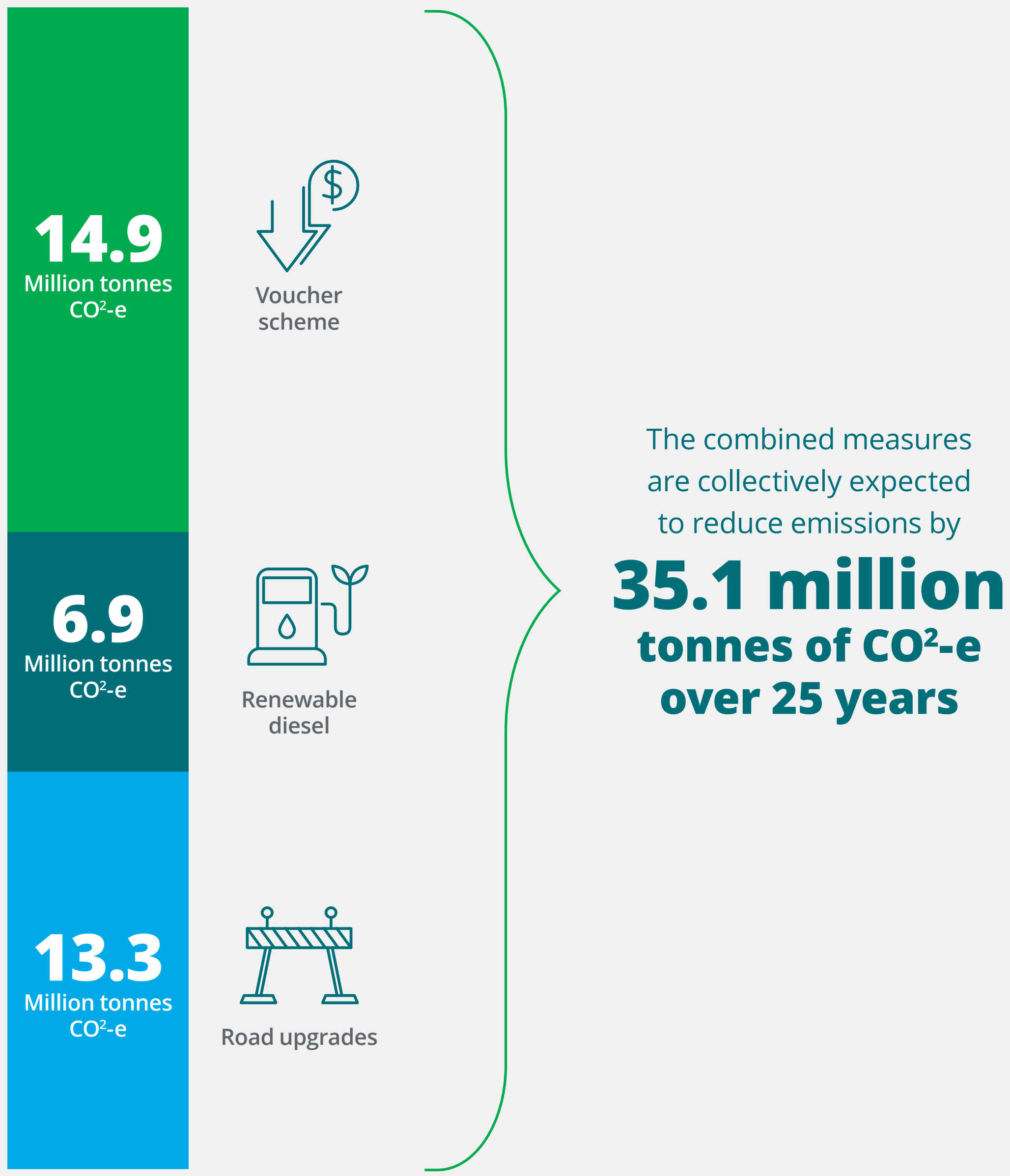
Source: Deloitte analysis informed by ATA modelling assumptions

A cumulative reduction of 8.8 million tonnes of CO_2-e over 25 years is expected due to higher average payloads. An additional cumulative 4.5 million tonnes of CO_2-e savings are expected by introducing HPVs and electric trucks to the fleet, supported by the Australian government network upgrades.

3.4 **Combined effect of policies**

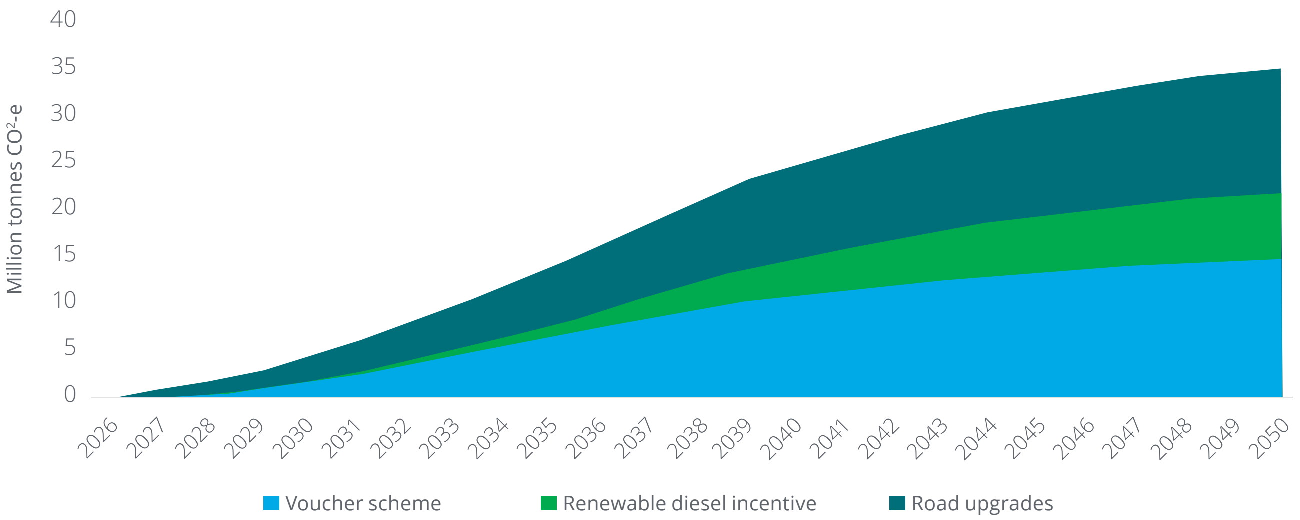
The three proposed ATA policy interventions are estimated to reduce emissions by a cumulative 35.1 million tonnes of CO_2-e over 25 years. This equates to a reduction of 9.3% in total cumulative emissions (over 25 years) compared to the base case (with no ATA policies in place).

Chart 3.12: Total emissions saved from all three policy interventions, 2026-2050



Source: Deloitte analysis informed by ATA modelling assumptions

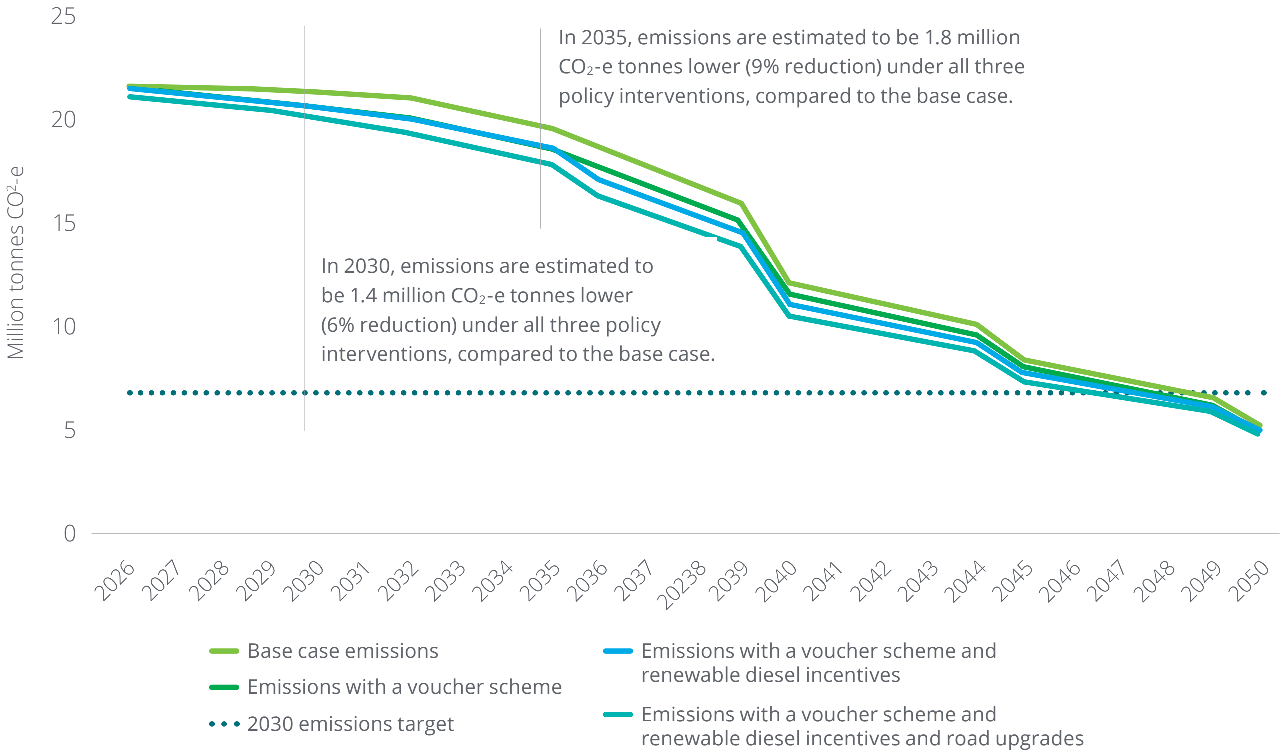
Chart 3.13: Cumulative emissions saved from all three policy interventions, 2026 - 2050



Source: Deloitte analysis informed by ATA modelling assumptions

The three ATA interventions are estimated to reduce emissions by 1.4 million CO_2-e in 2030, which is a 6% reduction on the base case emissions trajectory. The reduction increases to 1.8 million CO_2-e in 2035, which is a 9% reduction on the base case. The modelling shows that the three ATA policies could help Australia realise the 2030 emissions target (43% below 2005 levels) at a faster rate than would be otherwise possible – reaching the target 2 years earlier.

Chart 3.14: Emission profile under base case and under policy cases, 2026 - 2050



Source: Deloitte analysis informed by ATA modelling assumptions

Limitation of our work

General use restriction

This report is prepared solely for the internal use of Australian Trucking Association. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared to inform you of the most cost effective road freight transport GHG emission trajectory for the Australian road freight transport (both light and heavy vehicles). You should not refer to or use our name or the advice for any other purpose.

End notes

1 Vu Xuan Mi (Mia) Pham, Curtain University (2025), Business-as-Usual Model Road Freight Transport Emission Project Review and Closure Report.

2 Department of Infrastructure, Transport, Regional Development, Communication and the Arts (2024), Transport and Infrastructure Net Zero Consultation Roadmap, <https://www.infrastructure.gov.au/sites/default/files/documents/transport-and-infrastructure-net-zero-consultation-roadmap.pdf>

3 Department of Infrastructure, Transport, Regional Development, Communication and the Arts (2024), Transport and Infrastructure Net Zero Consultation Roadmap, <https://www.infrastructure.gov.au/sites/default/files/documents/transport-and-infrastructure-net-zero-consultation-roadmap.pdf>

4 The Integrated System Plan (ISP) is a whole-of-system plan that provides an integrated roadmap for the efficient development of the National Electricity Market (NEM) over the next 20 years and beyond. AEMO, 2024, Integrated System Plan (ISP). <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp>

5 Renewable Diesel, TfNSW, <https://www.transport.nsw.gov.au/operations/freight-hub/towards-net-zero-emissions-freight-policy/knowledge-hub/renewable-diesel>

6 Deloitte analysis; based on CSIRO data and AEMO ISP modelling.

7 Australian Trucking Association (2025), Fund Eight Road Projects to Reduce the Cost of Living, <Fund eight road projects to reduce the cost of living | Australian Trucking Association>

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