THE IMPACT OF CURRENT AUSTRALIAN NEW VEHICLE EFFICIENCY STANDARD (NVES) DESIGN ON CAR OBESITY

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Abstract

After more than a decade of debate, Australia has finally adopted a mandatory New Vehicle Efficiency Standard (NVES). Although the standard appears to implement ambitious reductions in the emissions performance of new vehicles from 2026 onwards, the design of the NVES carries a number of risks. This study used a new bespoke tool to examine one particular risk regarding car obesity. The simulation suggests that current NVES design allows for an increase in total real-world emissions of almost 6 million tonnes (9%) if 66% of suppliers would only sell their heaviest vehicle that was on sale in model year 2022 (MY 2022) in 2025, while keeping the sales of zero and low emission vehicles the same. Moreover the compliance gap would be reduced for about one third of suppliers, simply by selling heavier vehicles. A significant portion of suppliers (14%) even shift from the debit to the credit group, which means that they can make a profit instead of buying credits or paying a penalty, and would not have to reduce the emissions performance of their MY 2022 fleet. For effective operation of the NVES it will be critical to confirm these results using the Government's input data (not publicly released), adjust relevant design parameters or to put other policy measures in place to negate this unintentional and perverse effect.

Keywords: standard, emission, electric, road, NVES, car obesity.

1. Introduction

Road transport is a large and growing source of carbon dioxide (CO_2) emissions around the world. In Australia, CO_2 emissions from the road transport sector increased by more than 50% between 1990 and 2020, and during that time the contribution of road transport to Australia's greenhouse gas (GHG) emissions increased from 8% to 16% (TER/ICCT 2024).

Australia needs real and rapid reductions in CO_2 emissions from the transport sector. It has been estimated that Australia will fall short of the net-zero target in 2050 for road transport by a large margin (a total emission reduction of 35-45% in 2050 compared to 2019) unless emissions-mitigation policies are intensified and a portfolio of supporting policies are implemented (TER/ICCT 2024).

A mandatory fuel efficiency or emission standard is an internationally recognised key policy tool that reduces fleet-average CO_2 emissions from newly sold vehicles and a fundamental building block for effective emission mitigation policies.

Nevertheless, Australian policymakers debated for more than a decade whether to implement a mandatory standard for light-duty vehicles or not. Since 2008, the Australian Government has released six public consultation documents related to a proposed fuel efficiency standard. The mandatory New Vehicle Efficiency Standard (NVES) Bill 2024 finally passed Parliament in May 2024. But the long delay means we're starting from the back of the pack. Australian passenger vehicles are estimated to emit at least 50% more CO_2 than the global average (TER/ICCT 2024).

2. Independent impact assessment

The federal government experimented with different designs of the NVES and consulted industry and the wider community before reporting back on design options. In February 2024 the government defined three options: Option A (slow start); Option B (fast start and flexible); and Option C (fast start). Middle-of-the-road Option B was preferred, balancing "ambition and achievability" (AG 2024a).

After further consultation with industry, an updated report followed in March 2024 with changes to Option B (AG 2024b). Specific large SUVs were moved across to the more lenient light commercial vehicle category, which also became less stringent.

Although the government reports provide some useful information, there is insufficient detail to fully understand how the emission impacts were

estimated. So an independent and peer-reviewed research study was funded by Greenpeace Australia-Pacific and conducted by TER (2024) to assess the emission impacts of different standard design options. The study used a new bespoke tool (NVES tool, coded in R) and an associated input data file for vehicle model year (MY) 2022.

In contrast to the EU where emissions and sales data are publicly available for transparency and accountability, this is not the case in Australia, where the Federal Chamber of Automotive Industries (FCAI) controls access to these data. TER therefore reconstructed a detailed input file using publicly available data and information.

The NVES tool calculates the sales-weighted CO_2 exhaust emissions performance for each vehicle brand and then compares this with brand-specific targets, which are computed using NVES design parameters (e.g. headline target, reference mass, breakpoints, mass adjustment factor). An overview of key NVES parameters is shown in Table 1.

Table 1. NVES design specification by scenario and vehicle class (Source: TER, 2024).

NVES aspect *	Baseline		Option B		Draft Bill	
	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2
Category	-	-	Car, SUV	LCV	Car, SUV	SUV, LCV
HLT 2025 (NEDC, g CO_2/km)	-	-	141	199	141	210
HLT 2026	-	-	117	164	117	180
HLT 2027	-	-	92	129	92	150
HLT 2028	-	-	68	94	68	122
HLT 2029	-	-	58	81	58	110
Reference Mass 2022 → 2025 ** (kg)	-	-	1,723	2,155	1,723	2,155
SLC/MAF 2022 → 2025 **	-	-	0.0663	0.0324	0.0663	0.0324
Lower breakpoint 2025 (kg)	-	-	1,500	1,500	1,500	1,500
Upper breakpoint 2025 (kg)	-	-	2,000	2,200	2,200	2,400
Credit banking/trading (units)	-	-	Yes	Yes	Yes	Yes
Civil penalty (AUD per g/km)	-	-	$ 100	$ 100	$ 100	$ 100
Manufacturer pooling	-	-	No	No	No	No
Supercredits	-	-	No	No	No	No
Off-cycle credits/eco-innovation	-	-	No	No	No	No

* HLT = headline target/limit, SLC/MAF = slope limit curve/mass adjustment factor. ** These values are based on fleet data for vehicles sold in 2022 (MY) and they will apply to vehicles that will be sold in 2025. These values will be updated on a rolling annual basis during the operation of the NVES and may be adjusted for years after 2025, with the condition that headline limits must decrease over time or reflect a more stringent test procedure (Draft Bill Section 31).

The detailed MY 2022 input file was then used in the simulation to create an aggregated 2022 NVES input file listing total sales for each vehicle brand, as well as sales-weighted average values for 1) exhaust emissions performance (NEDC), 2) mass in running order (MIRO), 3) accumulated lifetime mileage, and 4) the NEDC to real-world correction factor.

TER has used the tool in this study to estimate (changes in) total real-world (on-road) lifetime exhaust CO_2 emissions from new Australian light-duty vehicles for five future vehicle model years, MYs 2025 to 2029, which are the years for which new vehicle efficiency targets have been set by the Federal Government. The tool estimates real-world (on-road) CO_2 exhaust emissions of future new vehicles over their useful life, and is not to be confused with a lifecycle emissions assessment (LCA).

The results were compared with a baseline scenario, which reflects the expected uptake of battery electric vehicles in the absence of the new standard (Figure 1). The study estimated that the NVES will significantly reduce on-road lifetime CO_2 emissions for new vehicles purchased between 2025 and 2029, i.e. it would save 87 million tonnes of real-world CO_2 emissions. In comparison, the original "Option B" version of the standard would have saved 103 million tonnes. Compared with having no fuel efficiency standards at all, the new standard is estimated to reduce emissions by 2% for model year 2025 vehicles. But it ramps up to 51% for vehicles sold in 2029.

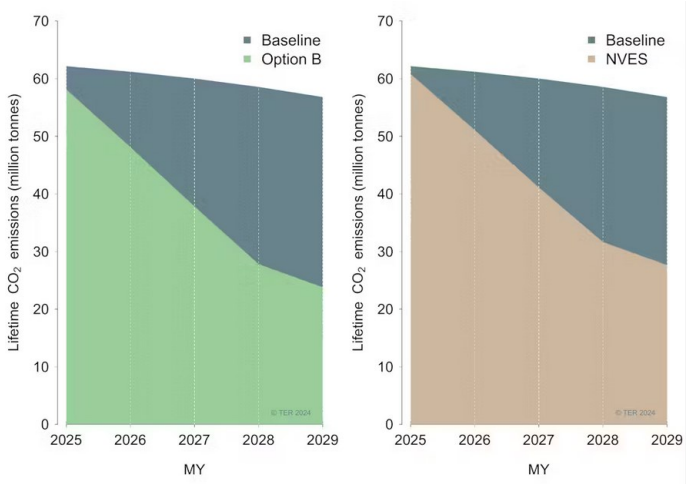

Figure 1. Comparing real-world lifetime CO_2 exhaust emissions for new vehicle efficiency standard (NVES) design options to baseline, for light vehicles with model years (MY) 2025 to 2029.

The TER (2024) study also found that the final design of the standard is weaker than the originally proposed Option B, which would have cut emissions by about 6% for model year 2025, increasing to 58% for model year 2029. The new standard also allows suppliers to trade emission credits. This means that if a certain supplier is overachieving and reducing emissions faster than they need to, they can carry over credits to another model year for a certain period, or sell them to an underachieving supplier. The inclusion of the credit-debit system was estimated to increase lifetime CO_2 emissions by 4.5% for MY 2025, reducing to 2.3% for MY 2029. A restriction of the credit-debit system to apply to internal credits only (i.e. the transfer option for credits between suppliers for monetary gains would be removed from the NVES) could result in additional real-world emission abatement.

3. Current NVES design risks

TER (2024) identified current features of the NVES design that could undermine its effectiveness.

First, to actually reduce emissions, the standard ideally captures on-road fuel consumption and emissions as closely as possible. Unfortunately, the

new standard is still based on an outdated test protocol that uses the New European Drive Cycle (NEDC), which was developed in the 1970s and significantly underestimates fuel consumption and emissions. The world has moved away from using this test protocol for quite some time now, due to a range of issues, but Australia is still using it. The government intends to update the test protocol and align with international best practice, but suggests waiting until at least mid-2028.

The NVES tool does correct NEDC emissions for real-world conditions, but Australian test data and further verification are required to ensure the real-world emission adjustments are accurate at vehicle make-model level.

Second, TER identified a risk that current NVES design may further encourage the trend towards selling increasingly large and heavy passenger vehicles (car obesity), making it even harder to reduce emissions from road transport. Car obesity refers to the sustained and increasing proportion of large and heavy passenger vehicles (SUVs, utes) in on-road fleets around the world, and particularly in Australia. These vehicles generally have a detrimental effect on energy efficiency and greenhouse gas emissions.

SUVs and utes are larger and heavier than conventional passenger cars and the laws of physics dictate they need substantially more energy and fuel per kilometre of driving, when compared with smaller and lighter vehicles.

TER estimated that on-road fleet-average CO_2 emissions rates (g/km) for Australian new passenger vehicles have not gone down as reported officially (NEDC), but have actually increased by a few percent each year since 2015. A sustained increase in vehicle weight and a shift to the sale of more four-wheel-drive cars (in other words, SUVs and large utes) were found to be the main factors contributing to this undesirable outcome (TER 2019).

4. NVES and car obesity

The question is if the current NVES design will either promote or impede car obesity, which will be explored in this section.

When the current NVES design is compared internationally, as was recently done by ICCT (2024), it appears there is a significant risk that car obesity will be promoted. In particular, the relatively steep slope of the NVES suggests that it may be beneficial for suppliers to sell more larger and heavier vehicles, as it would significantly increase their average emission targets, reduce their emission debits and/or increase their emission credits, with potentially additional monetary gains. In this study the NVES tool was used to examine this potential issue in more detail.

As a first step the NVES input file was modified to create a 'heavy vehicle sales' scenario, so that each supplier would only sell their heaviest passenger vehicles (car, SUV) or heaviest light commercial vehicles (LCV) in 2025. Battery electric and low emission vehicles (NEDC < 80 g CO_2/km) were excluded from this adjustment and retained in the input file. The benefit of this approach is that the impact assessment uses vehicles that already exist and were actually sold in 2022, each with its known (NEDC) emissions performance and vehicle mass.

The shift towards the sale of heavier vehicles is visualised in Figure 2. The black dots show the fleet average CO_2 emissions performance and vehicle mass. Each black dot represents the sales-weighted value for a particular supplier brand of Type 1 vehicles (cars, SUVs). A solid black dot indicates no shift in average mass (e.g. the supplier sells only one model in this vehicle type), whereas an open black dot shows the average values for the sales mix in 2022. The red solid dot then shows the average values for each supplier after the shift towards the sale of heavier vehicles. The arrow shows the extent and direction of the change.

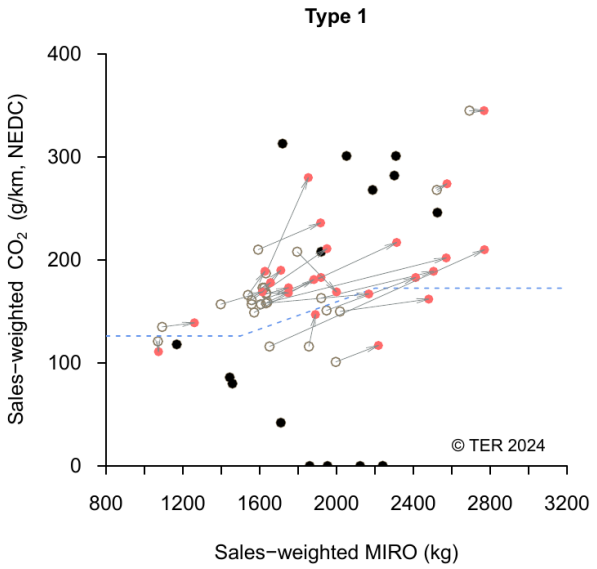

Figure 2. Simulated shift in sales-weighted average CO_2 emissions performance and vehicle mass due to the sale of heavier Type 1 vehicles for model year (MY) 2025 based on MY 2022 sales data.

A few interesting points are visible in Figure 2. Although the increase in mass generally increases NEDC emissions, as would be expected, the rate of increase varies substantially between suppliers. It can even improve the emissions performance in a few cases (i.e. a downward arrow). This reflects the technology choices that were made for specific makes and models (e.g. hybridisation), but also highlights the potential issues with the NEDC test

protocol, which can give unrealistic results for specific vehicle make and models.

The blue dotted line in Figure 2 shows the mass-dependent NVES limit curve for 2025, reflecting the design specifications that were outlined in Table 1 (e.g. headline target, mass adjustment factor, breakpoints).

The supplier-specific targets are determined by intersecting the sales-weighted average MIRO for each supplier with the limit curve. This is visualised with the vertical red dotted lines in Figure 3. Suppliers that fall above the limit curve belong to the debit group (emission reduction is required) and the ones below the curve belong to the credit group (no emission reduction required).

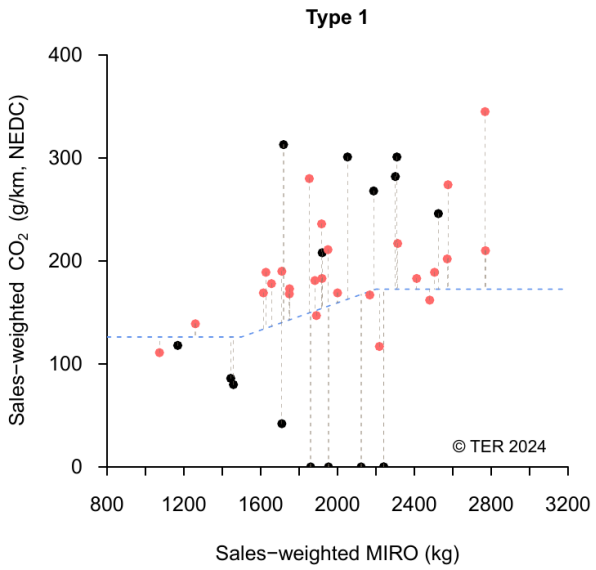

Figure 3. Determination of supplier-specific fleet emission targets for MY 2025 showing the “more heavy vehicle sales” adjusted MY 2022 input file.

Now that the specific targets are determined for each vehicle supplier, the emission simulation can be completed. Total exhaust emissions are estimated for each vehicle make by multiplying the specific (sales-weighted) NEDC emission targets (Figure 3) with brand-specific total annual sales, the sales-weighted accumulated mileage over a vehicle’s useful life and a further adjustment to account for real-world driving conditions. Further details on the emission estimation process can be found in TER (2024).

In the emission simulation it is assumed that both debit and credit suppliers will meet their respective targets. Therefore, vehicle brands that are in debit (underperforming) will change their sales mix to meet their respective MY-specific and brand-specific emission targets in order to avoid financial penalties.

Suppliers that have a sales-weighted emissions performance below the target (credit group), have a choice. They can sell and transfer their (net) credits to suppliers in the debit group who then have less stringent targets to meet, and thus generate more profit, or they can do nothing and keep performing at their baseline 2022 level, thereby generating an environmental (greenhouse gas emissions) benefit for society at large. In the simulation, it has been assumed that all suppliers that are in credit (e.g. BEV suppliers) will choose to increase profits and forego the environmental and climate benefits associated with lower emissions.

Figure 4 shows the relative change in real-world emissions when 29 out of 44 Australian vehicle suppliers (66%) shift their sales to the heaviest vehicle in their MY 2022 sales mix, but keeping the sales of battery electric and low emission vehicles the same. Figure 4 shows that the shift towards heavier vehicle sales generally has a detrimental effect on real world emissions, as is expected, but that the increase in emissions varies substantially between manufacturers, ranging from approximately 0% to 25%.

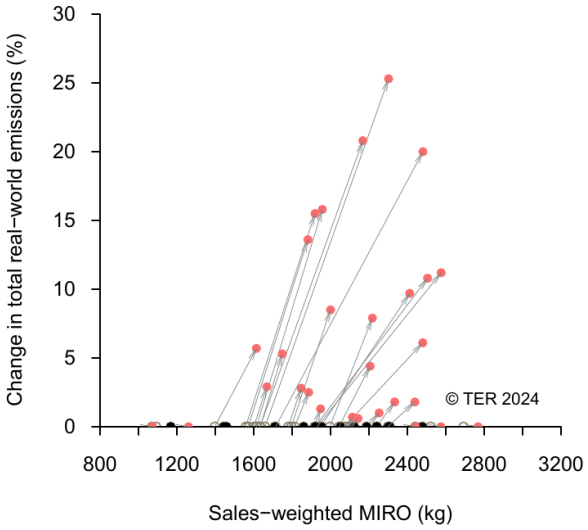

Figure 4. Change in total real-world greenhouse gas emissions for the new MY 2025 fleet when shifting towards the “more heavy vehicle sales” scenario.

At fleet level, where the results for all suppliers and Type 1 and 2 vehicles are combined, the average sales-weighted mass of light-duty vehicles (LDVs) sold in 2022 increased from 1,821 kg to 2,181 (20%) in the heavy vehicle impact assessment. The estimated impact on the total real-world emissions from LDVs in 2025 is an increase from 60.8 Mt (MY 2022 fleet mix) to 66.5 Mt (increased heavy vehicle sales), an increase of almost 6 million tonnes or 9%. This result indicates that the current design of the NVES allows for a significant increase in real-world greenhouse gas emissions for new vehicles,

if suppliers would decide to shift their sales mix towards heavier vehicles and continue this observed trend since 2015 in Australia.

The remaining question is if the current NVES design - in addition to allowing it - could also promote the shift towards heavier vehicle sales, which would be an unintentional and perverse effect. This would be the case if the emission reduction potential for suppliers in the debit group would be reduced by selling heavier vehicles. The emission reduction potential is defined as the difference between the supplier-specific emission target and its fleet emissions performance (NEDC). If this gap would be reduced, then manufacturers would have to make less effort to meet the standard.

Analysis of the emission simulation results for 2025 shows that 9 out of 29 suppliers (31%) could reduce the compliance gap by shifting towards the sale of heavier vehicles. Four of these nine suppliers (44%) even shift from the debit to the credit group, which means that they can make a profit and would not have to reduce the emissions performance of their MY 2022 fleet.

These results are concerning. If this scenario would eventuate in 2025, it would undermine the intent and effectiveness of the NVES. It will thus be important to change the design parameters of the NVES (e.g. slope of the limit curve) or to put other policy measures in place to negate this unintentional and perverse effect that 14% out of 29 manufacturers could financially benefit from not improving their emissions performance but instead by simply marketing and shifting their sales mix towards heavier vehicles.

Limitations and further work

The simulation results are based on a number of assumptions that will benefit from further verification, update and refinement.

First, the results are based on a reconstructed MY 2022 input database using publicly available data/information. It is recommended to verify the results by using the input data actually used (and not released) by the Federal Government or the same data managed and controlled by the FCAI. These data are currently not publicly available, in contrast to e.g. the European Union. Although a high level comparison between these different datasets suggests that the reconstructed input data should be reasonably accurate overall (TER, 2024), there is no guarantee that significant differences at the model/make level are absent.

Second, the simulation results are based on the MY 2022 sales profile for each manufacturer, the latest year for which these data are currently available. So the results effectively assume that the vehicle sales mix will remain approximately the same in 2025 and beyond, which is not likely. Suppliers will be able to change their sales profile by including, for instance, more zero or low emission vehicles and smaller and lighter vehicles, thereby extinguishing or reducing their emission debits and associated monetary impacts. In future refinement work and updates, it would be useful to consider brand-specific sales forecasts (if available), or to at least use updated MY sales data as they become progerssively available (2023, 2024, …) to capture market change as Australia moves closer to the NVES start year of 2025.

Third, the NVES will apply to type approval holders, not individual suppliers, which means that several manufacturers will be pooled based on (future) ownership and importing arrangements. For instance, Toyota, Mazda, Suzuki and Subaru were previously members of one manufacturer pool in the EU market. Further work is thus required to clarify this and to bundle manufacturers together accordingly, after which the results can be re-assessed and estimated more accurately.

Conclusions

After more than a decade of debate, Australia has finally adopted a mandatory New Vehicle Efficiency Standard (NVES). Although the standard appears to implement ambitious reductions in the emissions performance of new vehicles from 2026 onwards, the long delay in adopting a mandatory standard means Australia is starting from a high level of greenhouse gas emissions.

Moreover, the current design of the Australian standard carries a number of risks that could undermine the effectiveness in reducing greenhouse gas emissions from new Australian light-duty vehicles. In contrast to other jurisdictions like the EU, the NVES still uses an outdated emission test protocol, which is plagued by known issues and loopholes and significantly underestimates real-world emissions.

TER recently identified another risk that the current NVES design may further encourage the trend towards large heavy passenger vehicles (car obesity), with a detrimental effect on energy efficiency and emissions. A new bespoke tool (the NVES tool), recently developed by TER, was used to examine the risk of the current standard design further promoting car obesity in the Australian on-road passenger vehicle fleet.

The simulation assumed that each supplier that could do so (29 out of 44) would only sell their heaviest passenger vehicles (car, SUV) or heaviest light commercial vehicles (LCV) in 2025, which was on sale in 2022, while keeping the sales of battery electric and low emission vehicles the same. The

main effect is that the mass-based and supplier-specific targets can become more lenient, allowing higher emission levels and resulting in emission abatement loss.

At fleet level, the average sales-weighted mass of light-duty vehicles (LDVs) sold in 2022 increased by 20% with an estimated increase in total real-world emissions of almost 6 million tonnes or 9%. Furthermore, 9 out of 29 suppliers (31%) could reduce the compliance gap by shifting towards the sale of heavier vehicles. Four of 29 suppliers (14%) even shifted from the debit to the credit group, which means that they can actually make a profit instead of buying credits or paying penalties. These suppliers would therefore not have to reduce the emissions performance of their MY 2022 fleet in 2025.

Based on the results, it will be critical to change relevant design parameters for effective operation of the NVES. It is recommended that this includes:

- Modifying the slope of the limit curve to reduce the incentive to increase vehicle weight, including a transparent and publicly available report of how the limit curve has been developed and adjusted.
- An accelerated transition away from the NEDC test protocol towards real-world and/or WLTP test cycles, using independently assessed conversion factors.
- Transparent reporting on the real-world emissions impact of heavier SUVs being placed in the Type 2 category (light commercial vehicles), relative to remaining in Type 1.

Other policy measures may also need to be put in place to negate this unintentional and perverse effect. An example is closing a loophole in Australia's tax law that according to the Australia Institute (2024) effectively subsidises large utes such as Ram and Chevrolet pick-up trucks by avoiding the Luxury Car Tax (LCT) that other imported vehicles pay, regardless of if the vehicles are used for work, recreation or just commuting.

These corrections should be implemented prior to the government's proposed 2026 review of the NVES, in order to avoid a perverse outcome of the Australian fleet being encouraged to become even heavier, which will ultimately reduce the real-world emissions reduction potential of the standard, and limit the transport sectors ability to meaningfully contribute to Australia's emission reduction targets.

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