BRIEFING

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Light-duty vehicle classification for Australia's fuel efficiency standards

Prepared by Tanzila Khan and Zifei Yang

Although Australia does not currently have any mandatory fuel efficiency standards for on-road vehicles, the government is considering creating standards for new light-duty vehicles (LDVs). The consultation for a national electric vehicle strategy in late 2022 collected inputs for fuel efficiency standards and a separate consultation that proposes how LDV fuel efficiency standards for Australia would be designed is expected in early 2023.[1] The design of such standards affects their rigorousness, and effective design is critical for minimizing the potential for loopholes and maximizing the impact. Given this, this briefing discusses one important element of the design of fuel efficiency standards—how vehicles are classified—and we demonstrate how that decision is likely to impact carbon dioxide (CO_2) reductions from the LDV fleet in Australia.

BACKGROUND

The LDV category typically includes passenger cars (PCs) and light commercial vehicles (LCVs) or light trucks, and the regulatory definitions of PCs and LCVs vary by country.[2] In most countries, PCs are sedans, wagons, hatchbacks, and sport utility vehicles (SUVs) that carry passengers; however, a few countries, including the United States and Canada, classify certain SUVs as LCVs. LCVs or light trucks typically include pickup trucks, utility vehicles, and vans for carrying goods.

The regulations under the Australian Design Rule (ADR), which include the emission standards and fuel consumption labeling requirements for light vehicles, contain

1 Australian Government Department of Climate Change, Energy, the Environment and Water, "National Electric Vehicle Strategy: Consultation Paper," September 2022, https://app.converlens.com/industry/national-electric-vehicle-strategy.

2 "Passenger Vehicle Fuel Economy," International Council on Clean Transportation, accessed on February 6, 2023, https://theicct.org/pv-fuel-economy/

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no precedent for splitting or combining vehicle segments.[3] There are also voluntary LDV CO_2 emissions targets set by Australia's automotive industry group, the Federal Chamber of Automotive Industries (FCAI), and these include two sets of targets, one for non-SUV passenger cars and light SUVs and the other for heavier SUVs and LCVs.[4] The heavy SUV+LCV class is subject to more lenient targets than the other class and such segmentation, if adopted for Australia's regulation, might promote heavier SUVs and jeopardize the overall effectiveness of the standards. Indeed, in the United States, which has a split SUV segment, the LDV market has trended toward heavy SUVs in recent years and the overall fuel economy of the U.S. LDV fleet has not significantly improved.[5]

This briefing assesses LDVs in Australia and digs into some relevant details regarding standards design. We consider LDV classification and experiences in major vehicle markets, particularly the European Union and the United States, and evaluate the likely impact of various designs and LDV classification approaches on the CO_2 emissions from Australia's LDV fleet in the long term.

APPROACHES TO FUEL EFFICIENCY STANDARD DESIGN

Fuel efficiency standard curves are typically plots of CO_2 emissions in g/km, fuel consumption in l/100 km, or fuel economy in km/l, each as a function of vehicle attributes or utility. In the European Union and New Zealand, they are a function of vehicle mass, and in the United States they are based on vehicle footprint.[6] This approach allows for a diverse fleet in terms of shape, size, and functionality and promotes new technology across the fleet for compliance.[7]

Standard curves can be one of two types: one curve for all LDVs, or two separate curves, one for PCs and the other for LCVs. Although the latter allows LCVs to be

3 Vehicle Standard (Australian Design Rule 79/04 — Emission Control for Light Vehicles) 2011, Australian Government. Federal Register of Legislation, https://www.legislation.gov.au/Details/F2021C01200; Vehicle Standard (Australian Design Rule 81/02 – Fuel Consumption Labeling for Light Vehicles) 2008, Australian Government. Federal Register of Legislation, https://www.legislation.gov.au/Details/F2022C00213/Html/Volume_1

4 Federal Chamber of Automotive Industries, "CO_2 Standard: Rules for Calculating Brand Targets and Assessing Brand Compliance," (Kingston, ACT, March 12, 2020), https://www.fcai.com.au/library/publication/fcai_rules_for_calculating_co2_compliance.pdf; National Transport Commission, "Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2021," (Melbourne, Victoria, September 2022), https://www.ntc.gov.au/sites/default/files/assets/files/Carbon%20Dioxide%20Emissions%20Intensity%20for%20New%20Australian%20Light%20Vehicles%202021.pdf; Federal Chamber of Automotive Industries, "FCAI Releases Brand CO2 Emissions Data," news release, April 9, 2021, https://www.fcai.com.au/news/index/view/news/712.

5 U.S. Environmental Protection Agency, "The 2022 EPA Automotive Trends Report Greenhouse Gas Emissions, Fuel Economy, and Technology Since 1975," December 2022, https://www.epa.gov/system/files/documents/2022-12/420r22029.pdf.

6 Zifei Yang and Anup Bandivadekar, "2017 Global Update: Light-duty Vehicle Greenhouse Gas and Fuel Economy Standards," (ICCT: Washington, D.C., 2017), https://theicct.org/publication/2017-global-update-light-duty-vehicle-greenhouse-gas-and-fuel-economy-standards/.
European Union, "Setting CO_2 Emission Performance Standards for New Passenger Cars and for New Light Commercial Vehicles, and Repealing Regulations (EC) No 443/2009 and (EU) No 510/2011," Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R0631-20211202;
New Zealand legislation, "Land Transport (Clean Vehicle Standard) Regulations 2022," https://www.legislation.govt.nz/regulation/public/2022/0285/latest/whole.html;
U.S. Environmental Protection Agency, "Greenhouse Gas Emission Standards for Light-duty Vehicles, Light-duty Trucks, and Medium-duty Passenger Vehicles," 40 CFR 86.1818-12, https://www.govinfo.gov/content/pkg/CFR-2021-title40-vol21/pdf/CFR-2021-title40-vol21-sec86-1818-12.pdf

7 John German and Nic Lutsey. "Size or Mass? The Technical Rationale for Selecting Size as an Attribute for Vehicle Efficiency Standards," (ICCT: Washington, D.C., 2010), https://theicct.org/publication/size-or-mass-the-technical-rationale-for-selecting-size-as-an-attribute-for-vehicle-efficiency-standards/.
Footprint is more effective as an index attribute than vehicle weight for the standards because a footprint-based standard is technology neutral and equally promotes lightweighting technologies and lightweight materials along with other technologies; it is also less prone to gaming. Nonetheless, this is not the focus of this briefing, and it is not discussed further.

subject to less-stringent targets, PCs and LCVs have similar construction and power train technologies, and technologies that reduce fuel consumption or CO_2 emissions in PCs can also be applied on LCVs. In addition, if the single-curve standard is attribute-based, then the difference in vehicle weight or footprint leads to a difference in the standard stringency. For example, LCVs that are typically bigger and heavier would be subject to less-stringent standards than PCs by the design of a single-curve standard. Therefore, developing a separate curve for LCVs results in setting even more lenient targets for LCVs than PCs with the same attributes. Several countries have adopted the two-curves approach and such regulatory design creates the opportunity to shift to LCVs to qualify for less stringency. The risk of this "gaming" is highest in cases where the scope of LCVs is not restrictive enough and where the segment is not well defined.

CLASSIFICATION OF LDVs FOR THE EU CO_2 EMISSION STANDARDS

EU Regulation 2019/631 sets the CO_2 emission standards for PCs and LCVs for 2020 and later.[8] It covers PCs of category M_1 and LCVs of category N_1 and sets different standards for PCs and LCVs. The categorization of vehicles is defined in EU Regulation 2018/858 (former directive 2007/46/EC).[9] Category M_1 belongs to a broader category M, which is for motor vehicles designed and manufactured primarily for carrying passengers and their luggage. M_1 is defined as motor vehicles of eight or fewer seats in addition to the driver's seat with no space for standing passengers. Based on the 2021 new registrations data for the European Union, 99% of all SUVs are for carrying passengers.[10] Thus all PCs, including non-SUV cars and SUVs used for the purpose of carrying passengers, fall under the same standard curve for category M_1.

In contrast, category N_1 belongs to a broader category N that consists of motor vehicles designed and manufactured primarily for carrying goods where the goods-carrying capacity is equal to or greater than the passenger-carrying capacity. N_1 is defined as motor vehicles of maximum laden mass not more than 3,500 kg and N_1 vehicles with reference mass (unladen mass + 100 kg) of 2,610 kg or less, are subject to the LCV standards.

In 2021, the LCV share of the LDV market in the European Union was a little below 12%.[11] That means that about 88% of EU LDVs, including all non-SUV cars (50%) and SUVs (38%) used for carrying passengers, were subject to the more stringent standards.

Figure 1 illustrates type-approval CO_2 emissions on the Worldwide harmonized Light vehicles Test Procedure (WLTP) test cycle versus mass in running order of LDVs with internal combustion engines sold in the European Union in 2021.[12] The data points for non-SUV cars, SUVs, and LCVs closely overlap over a wide range of vehicle mass and emissions and this means that all types of LDVs are capable of complying with the same standard curve.

8 Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R0631-20211202

9 Regulation (EU) 2018/858 of the European Parliament and of the Council of 30 May 2018, "on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC," https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R0858-20221206

10 The International Council on Clean Transportation, "European Vehicle Market Statistics Pocketbook 2022/23," https://eupocketbook.org/.

11 ibid.

12 Data from "Monitoring of CO_2 emissions from passenger cars – Regulation (EU) 2019/631," https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-22; "Monitoring of CO_2 emissions from vans," https://www.eea.europa.eu/data-and-maps/data/vans-18

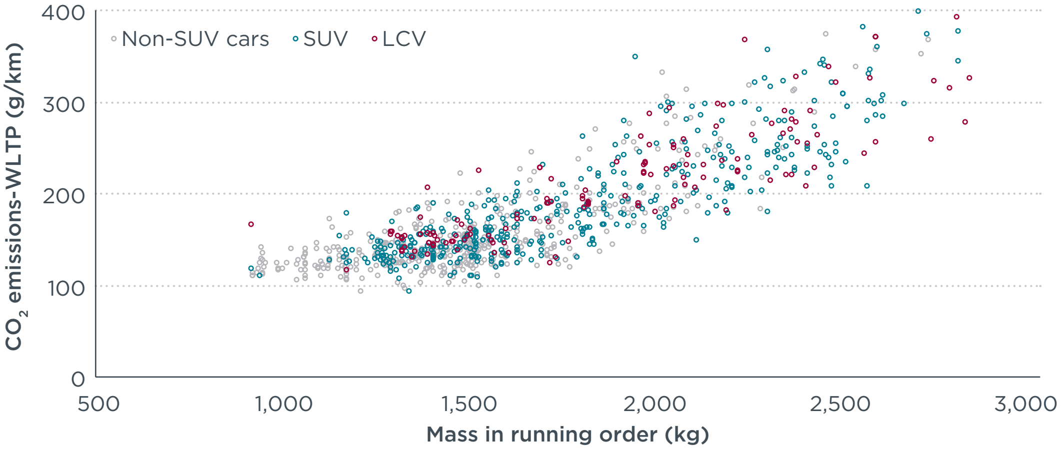

Figure 1. CO_2 emissions (g/km) on the Worldwide harmonized Light vehicles Test Procedure (WLTP) versus mass in running order for non-SUV passenger cars, SUVs, and LCVs based on EU vehicle registration data for 2021.

Similar LDV classification is also seen in New Zealand and Japan. New Zealand's LDV CO_2 emission standards include Type A and Type B vehicles, where Type A vehicles are cars and SUVs and Type B vehicles are LCVs including utility vehicles (utes[13]) and vans.[14] Japan's LDV standards include non-SUV cars and SUVs under the PC class, which is those that carry up to 10 passengers, including the driver; LCVs are defined as a separate class of vehicles that are designed to carry goods and have gross vehicle weight up to 3.5 tonnes.[15]

CLASSIFICATION OF LDVs FOR THE U.S. CO_2 EMISSION STANDARDS

U.S. LDV classes are defined under the Corporate Average Fuel Economy (CAFE) standards, which broadly classify LDVs as passenger automobiles and light trucks.[16] Passenger automobiles are LDVs that are not capable of off-highway operation, are manufactured primarily for the transportation of passengers but for not more than 10 individuals, and which have gross vehicle weight rating (GVWR) up to 8,500 lbs. (3,855 kg). Light trucks are vehicles that meet off-highway operation criteria including having GVWR of more than 6,000 lbs. (2,721 kg) or four-wheel drive and have other characteristics concerning ground clearance; they also meet various functionality requirements such as ability to transport more than 10 persons and to provide temporary living quarters, and they have greater cargo-carrying volume than passenger-carrying volume.

SUVs can fall under either class based on certain attributes. Two-wheel drive SUVs with GVWR of less than 6,000 lbs. that do not meet the functionality requirements of

13 A ute, an abbreviation for "utility" or "coupé utility," is a vehicle with a tonneau behind the passenger compartment in New Zealand: https://www.nzta.govt.nz/vehicles/vehicle-types/light-goods-vehicles/.

14 New Zealand Legislation. Land Transport (Clean Vehicles) Amendment Act 2022. https://www.legislation.govt.nz/act/public/2022/0002/latest/whole.html#LMS536334

15 Uwe Tietge et al., "From laboratory to road International A comparison of official and real-world fuel consumption and CO_2 values for passenger cars in Europe, the United states, China, and Japan," (ICCT: Berlin, Germany, 2017), https://theicct.org/publication/from-laboratory-to-road-international-a-comparison-of-official-and-real-world-fuel-consumption-and-co2-values-for-passenger-cars-in-europe-the-united-states-china-and-japan/; DieselNet, "Japan: Fuel Economy," https://dieselnet.com/standards/jp/fe.php

16 U.S. Environmental Protection Agency and National Highway Traffic Safety Administration, "40 CFR Parts 85, 86, and 600; 49 CFR Parts 531, 533, 536, et al. Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," Final Rule, May 7, 2010, https://www.gpo.gov/fdsys/pkg/FR-2010-05-07/pdf/2010-8159.pdf; U.S. Environmental Protection Agency, "The 2022 EPA Automotive Trends Report."

light trucks are defined as car SUVs. SUVs that meet the off-road operation criteria, meaning they are either four-wheel drive or above 6,000 lbs. GVWR, and meet the ground clearance characteristics are defined as truck SUVs.[17] With such categorization of car SUVs and truck SUVs, it is relatively simple for manufacturers to make minor modifications to vehicles in order to reclassify them as light trucks.

To qualify as a four-wheel drive SUV and thus as a light truck, a vehicle must have been originally manufactured as a four-wheel drive. A two-wheel drive SUV is not considered a four-wheel drive SUV, even if the same model is available as a four-wheel drive version. This requirement for four-wheel drive was set to prevent attempts to change existing two-wheel drive SUVs to qualify as truck SUVs to take advantage of the less-stringent requirements on the light-truck class.

That certain SUVs qualify as light trucks appears to have significantly influenced the U.S. LDV market. As shown in Figure 2, the market share of SUVs has increased from only about 2% in 1975 to 56% in 2021.[18] In 2021, truck SUVs accounted for 80% of SUV sales and about half of the U.S. LDV market; truck SUVs were a larger share than any other vehicle class in the United States. The growth in truck SUVs was the major contributor to the increase in light trucks, which in 2021 had a 63% market share, larger than that of cars and car SUVs, which had a combined 37%. These trends are contributing to the relatively modest fleet-wide efficiency improvements in the United States in recent years.

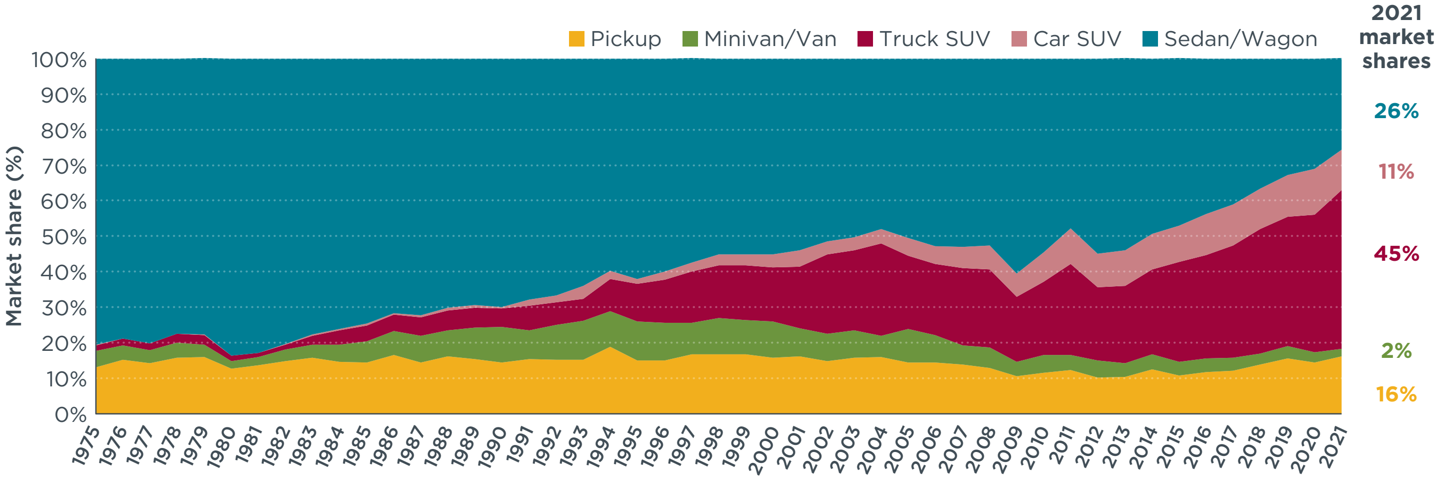

Figure 2. The U.S. LDV market by vehicle segment, 1975–2021.

Figure 3 illustrates the U.S. CO_2 emission standards curves for 2023 model year PCs and light trucks based on the data and equations given in 40 CFR 86.1818-12.[19] The flat portions of the curve represent standard levels for the respective limiting values of footprint, as applicable for a given vehicle type and model year. For a given footprint, light trucks have significantly higher standard values, meaning less-stringent standards than for PCs. Based on 2022 data for the United States, the average footprint for truck SUVs was 50 square feet, not substantially larger than the average for non-SUV cars and car SUVs, which was 47 square feet.[20] Still, a 2023 model year truck SUV with a 50 square feet footprint is allowed 22% higher CO_2 emissions than a PC of the same footprint. Furthermore, compared to a PC of 47 square feet footprint, a 2023 model

17 Nevertheless, as per the CAFE regulation, two-wheel drive SUVs with GVW below 6,000 lbs. can be classified as light trucks if they meet the functionality requirements of light trucks.

18 U.S. Environmental Protection Agency, "The 2022 EPA Automotive Trends Report."

19 U.S. Environmental Protection Agency, 40 CFR 86.1818-12, https://www.govinfo.gov/content/pkg/CFR-2021-title40-vol21/pdf/CFR-2021-title40-vol21-sec86-1818-12.pdf

20 U.S. Environmental Protection Agency, "Explore Trends Detailed Data," https://www.epa.gov/automotive-trends/explore-automotive-trends-data#DetailedData

year truck SUV of 50 square feet is allowed 30% higher CO_2 emissions. If truck SUVs were instead regulated as PCs, the difference in the corresponding stringency level would be only 6% for the same difference in footprint.

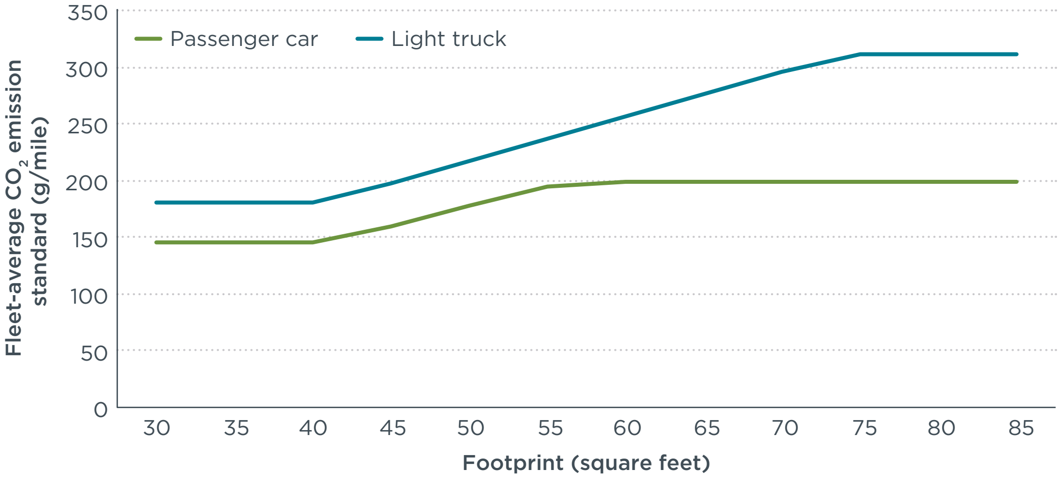

Figure 3. U.S. fleet-average CO_2 emissions standard curves for model year 2023 passenger cars and light trucks.

The situation in the United States is an example of what can happen if SUVs are differentiated from PCs—it can incentivize SUV manufacturers to take advantage of the less-stringent standards offered and weaken the overall effectiveness of the standards. This leads to less fuel savings and less emissions reduction than would otherwise be possible.

LDV CLASSIFICATION IN AUSTRALIA

The ADR has defined vehicle categories under the Road Vehicle Standards Act (2018) and the standard is referred to as the Vehicle Standard (Australian Design Rule – Definitions and Vehicle Categories) 2005.[21] Light-duty passenger vehicles have a maximum laden mass or gross vehicle mass (GVM) of not more than 3.5 tonnes and have up to nine seats including the driver's seat. This class includes three categories: MA for non-off-road and non-forward-control PCs;[22] MB for forward control but non-off-road passenger vehicles; and MC for off-road passenger vehicles that are four-wheel drive and meet certain characteristics for ground clearance and maneuver angles. Most of the heavy SUVs are off-road vehicles and thus typically fall under the MC category. Light goods vehicles are the NA category and they have a GVM not exceeding 3.5 tonnes. The MC and NA categories have further sub-categories: MC1 and NA1 are for vehicles with GVMs up to 2.7 tonnes and MC2 and NA2 are for vehicles over 2.7 tonnes.

Australia has standards for LDV exhaust and evaporative emissions under ADR 79/04 and requirements for fuel consumption labeling under ADR 81/02.[23] These emission standards and labeling requirements apply for general "M" and "N" category LDVs

21 Vehicle Standard (Australian Design Rule – Definitions and Vehicle Categories) 2005, Australian Government. Federal Register of Legislation, https://www.legislation.gov.au/Details/F2022C01069

22 A forward-control vehicle is defined in the ADR as a motor vehicle in which the center of the steering wheel is in the forward quarter of the vehicle's "total length," in other words, the longitudinal distance between the front end and the rear end of a vehicle.

23 Vehicle Standard (Australian Design Rule 79/04 — Emission Control for Light Vehicles) 2011, Australian Government. Federal Register of Legislation, https://www.legislation.gov.au/Details/F2021C01200; Vehicle Standard (Australian Design Rule 81/02 – Fuel Consumption Labeling for Light Vehicles) 2008, Australian Government. Federal Register of Legislation, https://www.legislation.gov.au/Details/F2022C00213/Html/Volume_1

of GVM not exceeding 3.5 tonnes. There is no precedent for splitting SUVs into two categories in these regulations.

The classification of SUVs is important because SUVs are a significant portion of LDV sales in Australia. Sales from 2012 to 2022 are shown in Figure 4, which is based on Marklines data.[24] A further split of the market shares into light and heavy SUVs is shown for 2020 and 2021, and it was derived from FCAI's reported data and Marklines data.[25] The trend in Australia's LDV market is similar to that in the United States, as the SUV market share has significantly increased over the years from 30% to about 58%. Light SUVs were about 41% of Australia's 2021 LDV fleet and heavier SUVs were about 14% that year.[26]

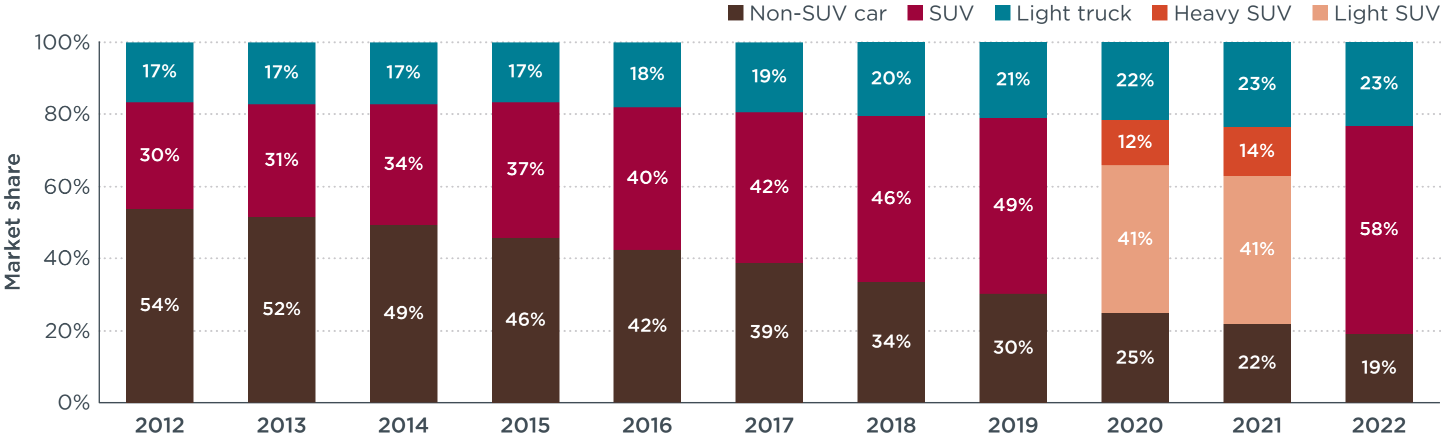

Figure 4. Australia's LDV market from 2012 to 2022 for non-SUV cars, SUVs, and light trucks.

Thus, if heavier SUVs are subject to the same standards as the NA category, there is a risk that the 41% light SUVs could be shifted by manufacturers to the heavier category. This would make the standards less stringent for the majority of the Australian LDV market and such a shift could happen faster in Australia than in other countries because Australia imports all of its LDVs.

LONG-TERM IMPACT OF DIFFERENT CLASSIFICATION APPROACHES

We developed scenarios to model the CO_2 emissions reductions from the three standard designs discussed in this briefing: one standard curve for LDVs ("One-curve"), two standard curves that align with Europe's existing standard classification approach ("Two curves–PC/LCV"), and two standard curves that align with the U.S. approach ("Two curves–SUV split").

We estimated the changes in the fleet structure, in other words, the distribution of various classes in new LDV sales that would be affected by the three designs. We

24 Marklines, https://www.marklines.com/en/.

25 Information on light and heavy SUVs is available in the National Transport Commission reports for 2020 and 2021 only, since the FCAI set the voluntary CO_2 targets in 2020 and the most recent report was for 2021. National Transport Commission, "Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2021," https://www.ntc.gov.au/sites/default/files/assets/files/Carbon%20Dioxide%20Emissions%20Intensity%20for%20New%20Australian%20Light%20Vehicles%202021.pdf; and National Transport Commission, "Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2020," https://www.ntc.gov.au/sites/default/files/assets/files/Carbon%20dioxide%20emissions%20intensity%20for%20new%20Australian%20light%20vehicles%202020.pdf

26 Sample calculation for light and heavy SUV shares in 2021: FCAI data shows that PC + light SUVs were 63% and heavy SUVs + LCVs were 37% of Australia's 2021 LDV sales. 2021 market shares for PCs and light trucks are 22% and 23%, respectively, based on Marklines data. Therefore, using the FCAI's total sales for PC + light SUVs and heavy SUV + LCVs for 2021, light SUV share is 63%-22% = 41% and heavy SUV share is 37%-23% = 14%.

assumed no change to the fleet structure with the "Two curves–PC/LCV" design, and thus the sales shares of different vehicle classes reflect the status quo of Australia's 2021 fleet. The "One-curve" design was assumed to reduce the SUV sales share compared to the status quo. Because the SUV sales share is already high in Australia, we assumed the SUV sales share would drop to a similar level as the 2021 European market. In contrast, the "Two curves–SUV split" design was estimated to increase the share of SUVs that belong to the MC class compared with the status quo. Because the United States has this classification approach for its fuel efficiency standards, we assumed the MA and MC split of SUVs in Australia will shift to align with the SUV split in the United States' 2021 new LDV fleet. We further assumed that the standards first take effect in 2024 and the changes in the new LDV fleet happen as the standards take effect in 2024.

The changes in fleet structure will affect the average CO_2 emissions of internal combustion engine vehicles and to estimate this impact, we used the average CO_2 emissions performance by class of the 2021 new LDV fleet in the United States to reflect the differences in CO_2 emissions across different LDV classes. The U.S. data was chosen for this because the same data is not available for the Australian fleet. We found that in 2024, the "Two curves–SUV split" design would increase the sales-weighted average CO_2 emissions of internal combustion engine vehicles by 10%, whereas the "One-curve" design would decrease the average CO_2 emissions by 4%, both compared to the "Two curves–PC/LCV" design. We assumed these differences in sales-weighted average emissions between the approaches would be constant each year from 2024 through 2050.

We then evaluated different stringency levels for standards, one aligned with the FCAI voluntary CO_2 emissions targets and the other aligned with world-class ambitions. The methods and assumptions for estimating the CO_2 emissions reductions were detailed in an earlier ICCT working paper.[27] This estimation took the same approach using ICCT's Roadmap model[28] and we considered the impact of different fleet structures on the sales-weighted average CO_2 emissions of the internal combustion engine vehicles.

Table 1 summarizes the sales shares by vehicle class assumed under different standard design scenarios and the model results for well-to-wheel (WTW) CO_2 emissions from Australia's on-road LDV fleet accumulated from 2019 to 2050, for each scenario.

Table 1. Sales share assumptions and predicted emissions for various approaches to standard design

Design approach	One curve	Two curves–PC/LCV	Two curves–SUV split
Sales shares (%)			
Non-SUV cars	44%	22%	19%
SUV (MA)	27%	41%	11%
SUV (MC)	9%	14%	45%
Light truck	20%	23%	25%
Model results: cumulative well-to-wheel CO_2 emissions 2019–2050 (million tonnes)			
With FCAI targets	2,182	2,225	2,343
With world class ambitions	1,477	1,490	1,525

Observe that the Two curves–SUV split approach yields the highest cumulative WTW emissions. Under the world-class scenario, the split approach emits 35 million tonnes (Mt) more cumulative emissions from 2019 to 2050 than the Two curves–PC/LCV

27 Tanzila Khan et al., "Fuel Efficiency Standards to Decarbonize Australia's Light-duty Vehicles," (ICCT: Washington, D.C., 2022), https://theicct.org/publication/pv-australia-co2-standards-dec22/

28 ICCT Roadmap model version 1.9, (2022), https://theicct.github.io/roadmap-doc/versions/v1.9/

approach and 48 Mt more emissions compared to the One-curve approach. The effect of the split approach is even worse for the less stringent FCAI-aligned scenario in which the split approach has 118 Mt and 161 Mt more cumulative emissions, respectively, than the Two curve-PC/LCV and One-curve approach.

SUMMARY AND SUGGESTIONS FOR POLICY DESIGN

This briefing reviewed LDV classification practices for fuel efficiency standards in major vehicle markets and also evaluated the impact of different standard design approaches on long-term CO_2 emissions. Based on the results of our modeling, we suggest that Australia adopt a one-curve approach for all LDVs, including passenger cars and light trucks. The modeling showed that such an approach yields fewer cumulative CO_2 emissions from 2019 to 2050 than the other approaches. Even with the most ambitious world-leading standards, the Two curves–SUV split approach we modeled would yield 35 Mt and 48 Mt more cumulative CO_2 emissions, respectively, than the Two curves–PC/LCV approach and the One-curve approach. The emissions from a split approach would be even higher if the less-stringent FCAI targets are adopted in the standards.

In case Australia chooses to adopt a two-curves approach, we suggest designing one standard curve for all light-duty passenger vehicles under the "M" category, including MA, MB, and MC, and a separate standard curve for light trucks that fall under the "NA" category in the Australian Design Rule. This means keeping the same set of targets for all SUVs and passenger cars, including SUVs that are classified as off-road vehicles under the MC category.

In the European Union, New Zealand, and Japan, the practice is to keep SUVs and non-SUV cars in one category under passenger cars, and LCVs or light trucks belong to a separate category. Non-SUV cars, SUVs, and light trucks all have similar patterns of CO_2 emissions relative to vehicle mass in the European Union. Indeed, because the same emission reduction technologies can be applied to all LDV types, even if Australia adopts a two-curves approach, there is no need to split the SUV segment and allow certain heavier SUVs to be in a separate class with light trucks.

In the United States, where car SUVs and truck SUVs are subject to different standard curves, there has been a significant increase in sales of truck SUVs, from 2% of the LDV market in 1975 to 45% in 2021. That the truck SUVs with the largest LDV market share have been subject to less-stringent standards than passenger cars runs counter to the goal of an effective fuel efficiency standard. The vehicle segmentation in FCAI's voluntary emission standards, which merges certain heavier SUVs with vehicles in NA category, risks similar consequences as in the United States. SUVs already grew from 30% to 55% of the Australian LDV market from 2012 to 2021. While heavy SUVs were only 14% of the Australian LDV market in 2021, light SUVs had a 41% share and the heavy SUV market will likely increase substantially in the future if those vehicles are granted less-stringent standards. The impact of this would be less CO_2 emissions reduction than could otherwise be achieved by the standards.