MOVEMENT
transport energy environment

Charles Sturt University

# CSU Green Fleet

*A vehicle rating scheme to drive fleet sustainability at Charles Sturt University*

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# THE MISSION

## Sustainability as core business at CSU

Charles Sturt University is committed to leadership in sustainability. It's focus is to reduce energy and water use, moving the University towards sustainability across all operations and platforms.

Examples of this commitment include:

- CSU is a proud member of the Australasian Campuses Towards Sustainability (ACTS).
- CSU is a signatory to the Tallories Declaration covering more than 350 universities globally.
- In 2016, CSU became Australia's first certified carbon neutral university.
- In 2017 CSU worked with the NSW government via the Sustainability Advantage program to draft a Clean Energy Strategy. The draft strategy identified key pathways for CSU to shift to renewable energy in its operations in the period to 2030.

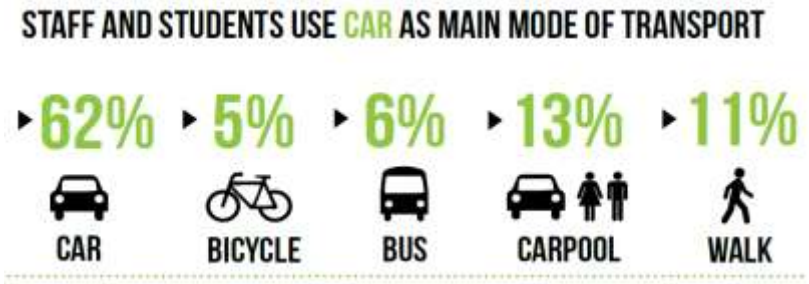
## CSU Green

CSU Green is the hub for communication and coordination of the sustainability efforts across the CSU campuses – including monitoring, promoting, and reporting progress.

CSU LiFE

CSU Green uses the LiFE program: a structured process tailored for tertiary education institutions to assess, plan and improve their operations in key areas . LiFE helps manage and document evidence of sustainability so that CSU can gain accreditation and benchmark against around 70 other institutions around the world.

Energy and emissions from the CSU vehicle fleet are a key part of the path to sustainability.



# THE FLEET

## Fleet profile

The CSU fleet comprises around 270 vehicles, split approximately evenly between passenger cars and commercial vehicles.

Passenger cars (54%) include sedans, station wagons and SUVs. Commercial vehicles include vans, utilities, small buses and trucks.

Fleet Services currently uses engine size to differentiate the main car classes, for the purposes of bookings and internal cost recovery. These classes include:

- Passenger cars under 2.0 litres
- Passenger cars 2.0 to under 2.8 litres
- Passenger car 2.8 to under 4.0 litres
- Passenger car larger than 4.0 litres
- Commercial vehicles (utilities and vans)

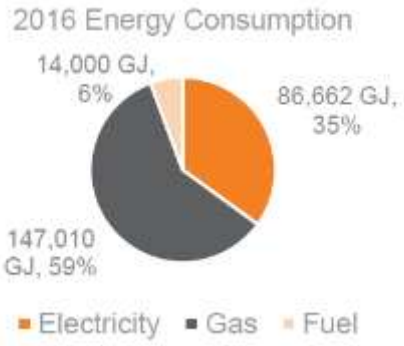
The 2.0 to 2.8 litre engine class is currently the largest group of cars, and consists mostly of SUVs.

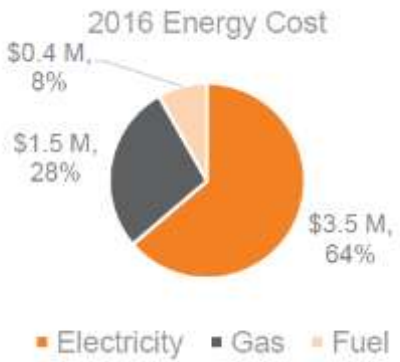
The National Transport Commission (NTC) and the car industry peak body (FCAI) use different size and function classifications than CSU. These are shown in Appendix A and are used as the basis of functional comparisons in setting rating thresholds in this project.

## Energy and emissions

In 2016, the CSU vehicle fleet used approximately 6% of total university energy. This represented around 2% of CSU's total greenhouse gas emissions.

However, because vehicle fuel is relatively more expensive than electricity, fuel accounts for around $400,000 or 8% of total energy costs (see Figures below).



# THE PROBLEM: A vehicle rating scheme for CSU

## No single definition of "Green" vehicle

Motor vehicles have several environmental impacts. The two main concerns are air pollution from engine exhaust, and greenhouse gas emissions driving climate change. "Clean" is often used to describe vehicles with low levels of exhaust pollution; and "Green" is often applied to more fuel-efficient models with lower greenhouse gas intensity (grams of $CO_2$/km). However, the terms are sometimes used interchangeably, and there is no single accepted definition of a green/clean vehicle.

- California coined the terms "zero-emission" and "ultra-low emission" vehicles in response to chronic air pollution. In practice, electric vehicles can achieve zero emissions only if they are powered by renewable energy.
- In Australia, the National Transport Commission describes a "green" car as one producing less than 120 grams $CO_2$/km (similar to a threshold in Sweden). But that hasn't changed since 2009 so it doesn't reflect the latest efficient vehicles.
- In 2016, the average emissions intensity for all new cars in Europe was 118 g/km. So the average European car is already below NTC's "green" threshold. That average is required to drop even further, to 95 g/km by 2020.
- Clean Energy Finance Corporation (CEFC) provides incentives for purchasing the most efficient vehicles by category/class.

## No guidance from the Green Vehicle Guide

The *Green Vehicle Guide* is a website intended to provide information about fuel consumption and environmental performance of new light vehicles. Until 2014, it provided a composite green vehicle score out of 5 stars, covering both pollution and $CO_2$. The *Green Vehicle Guide* has since abandoned its star ratings and now reports only a single number, which is the carbon emissions intensity for each vehicle model.

## A fresh start

In 2014, CSU launched a fleet rating scheme based on the *Green Vehicle Guide* scoring system. Each vehicle in the fleet was given a star rating (with 5 stars the highest) based on its greenhouse score in the GVG. The star rating was displayed to fleet users via a sticker on the rear window.

However when star ratings were abandoned by the *Green Vehicle Guide*, CSU also had to stop using its rating stickers because the scores were no longer available for new vehicles.

CSU wants to revive its star rating scheme for its original purpose: education, engagement, and fleet improvement. To do this, it needs to update the thresholds that define each step in the star ratings based on current industry best practice.

# THE CHALLENGES

## Full cost recovery

Fleet Services receives no funding from the university, so it must fully fund its own fleet procurement and operating costs. It does this by charging rental fees on internal and external fleet users. Vehicles in different classes are rented at different fee rates, reflecting different operating costs. One implication of this self-funded model is a preference for vehicles with higher resale values, which don't always correlate with greener vehicles. SUVs and some commercial vehicle models have better resale value.

## Function first (fit for purpose)

The primary consideration for CSU vehicles is that they are fit-for-purpose, including suitability for extended trips in regional areas. This requirement has been one factor precluding the use of alternative fuels and electric vehicles, with limited access to fast refuelling/recharging networks. Availability of suitable models in the right categories (e.g. SUVs) has also been a factor.

## No CO2 data for heavy vehicles

Greenhouse gas emissions intensity ($CO_2$ per km), is not available for heavy vehicles above 3.5 tonnes, because they are not tested the same way as light vehicles.

## Engine size less relevant today

Many vehicles now come equipped with some form of engine boosting (turbo, supercharger, or electric compressor), or with some degree of electric hybrid technology. This means engine size is no longer the best indicator of fuel efficiency or emissions. For example, one current 4.0 litre V8 luxury hybrid sedan would be classed in the largest of CSU's engine categories; yet it's official fuel efficiency and $CO_2$ output is better than a Toyota Prius.

## Shifting green goalposts

In addition to the lack of an agreed "green" car definition, the fuel efficiency and environmental performance of new vehicles is improving rapidly. In 2016 there were only 12 models with CO2 emissions below 80 grams/km; but in 2018 all the top 20 performers are below that figure.

## Limited options for clean energy

CSU's draft Clean Energy Strategy sets targets to reduce fleet energy use by 35% by 2025 and 80% by 2030, mainly from a switch to electric vehicles. However, clean energy vehicles are currently an immature market in Australia. There are only a few EV models available at the time of this study, and fewer still at the price and segments relevant to CSU's fleet. Options for Hydrogen or other renewable fuels are even more limited. This will change as new models enter the market over the next 2-3 years.

# THE SOLUTION

## Two vehicle classes: a double standard

To keep the rating system simple, all vehicles in the fleet are classified as either:

- passenger cars (includes SUVs); or
- light commercial vehicles (utilities and vans).

This reflects significant differences in construction method and body styles, leading to large differences in fuel consumption and $CO_2$ emissions (with LCVs worse).

$CO_2$ data is not available for trucks and buses heavier than 3.5 tonnes, so these vehicles are excluded at this stage.

## Five levels of "green"

To support CSU's existing rating labels, the top ranking is five stars. Ratings drop by half a star for each subsequent category, based on performance against greenhouse gas intensity (grams $CO_2$/km) bands – see Table on the right.

## Qualifying

There are no ratings below 3 stars, for two reasons. Firstly, the scheme should recognise environmental achievement, so poor performers should not be rated "green". Secondly, CSU does not have stickers for ratings less than 3 stars. As a result, this becomes a qualifying level, with anything less than 3 stars not considered a green vehicle.

| Passenger Vehicle | | LCV |
|---|---|---|
| $CO_2$ emissions | | $CO_2$ emissions |
| 60 g/km or less | 5 stars | 60 g/km or less |
| 61 – 90 g/km | 4.5 stars | 61 – 120 g/km |
| 91 – 120 g/km | 4 stars | 121 – 175 g/km |
| 121 – 135 g/km | 3.5 stars | 176 – 200 g/km |
| 136 – 175 g/km | 3 stars | 201 – 225 g/km |
| 176 g/km or more | No stars | 226 g/km or more |

# THE RATIONALE

CSU's objectives for the revised rating scheme are for it to be both ambitious and realistic, reflecting current best practice. Thresholds for the star ratings were set to achieve those aims.

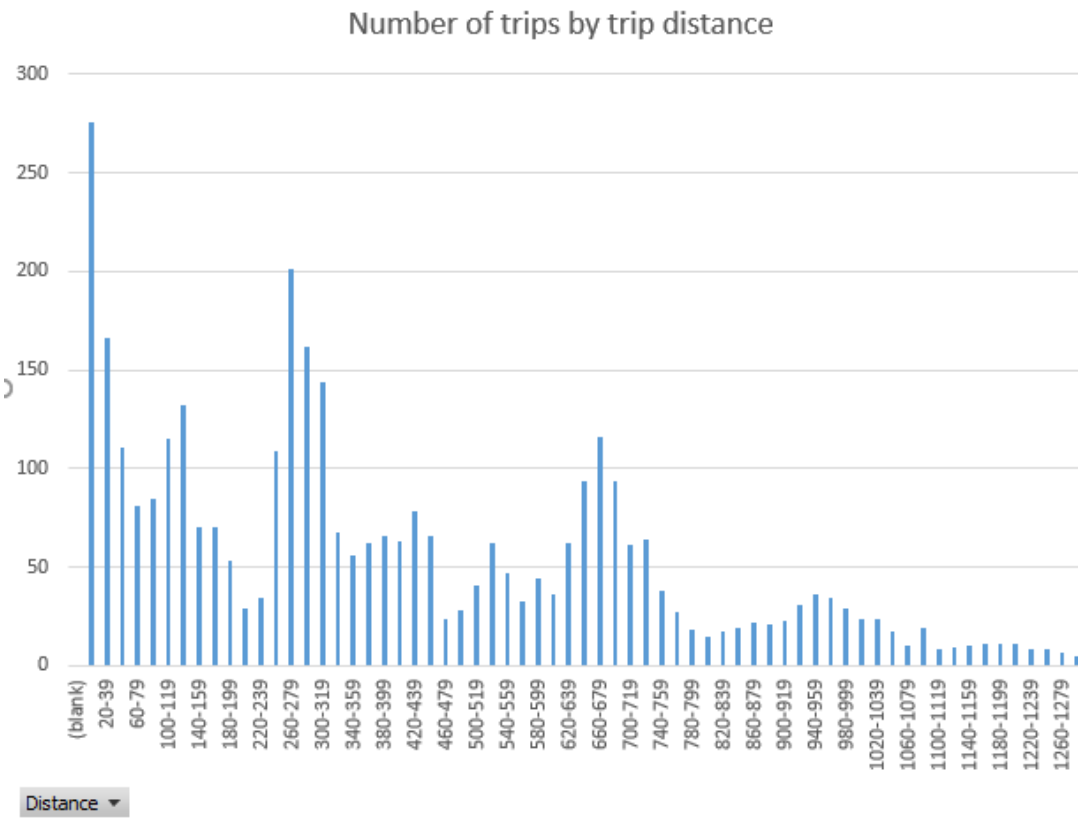
## 5 stars: potential for zero emissions

As the highest rating possible, this category should recognise vehicles that are currently the best performers in the market. There are five vehicles in Australia across several classes that achieve zero emissions, and another nine below 50 g/km. Several other models are likely to arrive in 2018, and more in 2019.

While this would have been a sufficient condition to define best practice, it is also interesting that all those vehicles employ some degree of electrification – either a pure battery EV or a plug-in hybrid drivetrain. As a result, all can operate for at least 30km to 50km with no tailpipe emissions at all.

Intuitively, the *potential* for zero emissions seems an appropriate aspirational goal for the highest rating, and the 60 g/km limit permits the use of technologies other than pure battery EVs. The potential is the same for both cars and LCVs using this technology, so the 5-star limit is set at the same threshold for both classes.

Analysis of trip bookings for pool vehicles shows that the most common trip distance is in the 0-20km range, and the 20-39km distance is the third most common. A five star vehicle could complete these common trips with no emissions whatsoever.



# THE RATIONALE

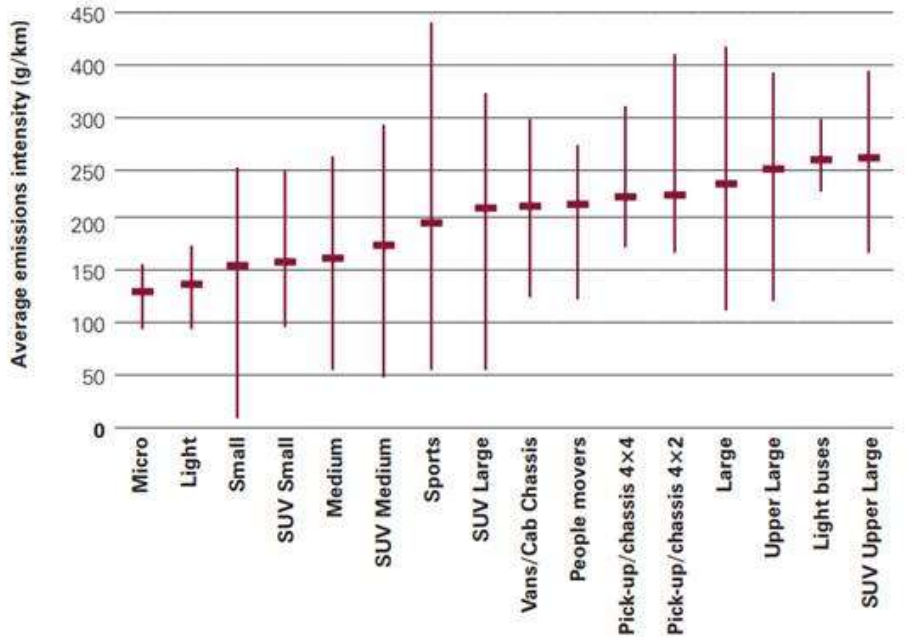
## 4 stars: best-in-class

A class-relevant target recognises the importance of vehicle function in the CSU fleet – whether that be the use of LCVs for trade functions or SUVs for regional trips with multiple passengers.

Not all vehicle classes in the market currently have EVs or plug-in hybrid options available. But many of the classes that CSU operates do have vehicles at or below 120 g/km available for purchase. This is clear in the Figure at right, showing both the average and the range of emissions intensity (lowest/highest) for each Australian vehicle class.

The 4-star rating recognises performance that is nominally near the best-in-class (to meet functional needs), but which does not achieve ideal zero-emission capability. Thresholds for cars and LCVs were set at different levels to reflect real performance differences, but there are utes and vans currently available <175 g/km that would score 4 stars.

4 ½ stars recognises vehicles that are likely to be right at the top of their class, some of which may have zero-emission potential.




*Source: NTC 2017*

## 3 stars: above average performers

The graph shows the average emission intensity for vehicle classes in the Australian market. More information is provided in the table in Appendix B. For the most common car classes in the CSU fleet (Light, Small, Medium, and corresponding SUV sizes), the average emission intensity tends to be less than 175 g/km. That was used as the 3-star rating criterion, with 3½ stars awarded to vehicles significantly better than average ( < 135 g/km).

For the LCV classes (shown as van/cc and pick-up/chassis in the graph), the averages are higher. That is reflected in a more lenient threshold of 225 g/km to achieve 3 stars, and 200 g/km to achieve 3.5 stars.

# EXAMPLES

## Passenger cars

Nissan Leaf

Renault Zoe

Outlander PHEV

## RATING (full star)


## Light commercial vehicles

Renault Kangoo ZE

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Toyota Camry hybrid

Toyota Prius

Toyota Corolla hybrid


Ford Ranger 2WD

Renault Kangoo

VW Caddy

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Toyota Corolla

Honda CRV

Toyota RAV4

Subaru Forester 2.0 petrol or diesel


Hilux / Ranger 4WD dual cab

Hyundai iMax

Hyundai iLoad

# THE PATH AHEAD

## Scheme review and update

As mentioned earlier, fuel efficiency and environmental performance of new vehicles tends to improve with each new model release. This produces a gradual improvement in the vehicle market. So, what is considered industry best practice today may not be so in future years.

CSU intends to use the rating scheme to track fleet improvements over time – comparing the average star rating in future years as vehicles are replaced, with how the fleet performs today (the 2017 baseline). To do so, the star rating thresholds should remain fixed for a 3-year period. This aligns with the typical service life of cars in the fleet and allows for a full turnover of the car fleet and some LCVs.

After the initial 3-year period (e.g. 2020), the star thresholds should be reviewed to ensure the emissions levels still reflect the performance objectives at that time: zero-emission potential (5 stars), best-in-class (4 stars), and better than class-average (3 stars).

Fixing the thresholds for this relatively short period shouldn't affect the scheme's effectiveness or credibility, provided there is a commitment to review and, if necessary, adjust the criteria. This is because:

- The 5-star threshold is sufficiently ambitious that, even in 2-3 years, only vehicles that can run emissions-free for a period will achieve it.
- The 4-star threshold is a broad stretch target across several vehicle segments (and aligned with NTC's "green" vehicle definitions).
- Individual models may emerge as new best-in-class performers, but the average across the whole class (3 star) will fall more slowly as consumer purchasing preferences take longer to shift.

## Incentivising users

Behaviour change is easier with financial incentives (or penalties). CSU policies set rental fees for users of the fleet, with current charges varying by engine size class and function. However, these do not fully reflect the differences in vehicle environmental impacts.

Once the rating scheme is re-established, CSU could add a rental fee component that preferences higher-rated vehicles. This might be made revenue neutral by increasing the rental fee for lower rated vehicles (no stars) to offset lower fees for higher-rated vehicles (4 stars and above).

## Full cost recovery

An additional measure supporting a rental fee adjustment would be the establishment of an internal carbon price. This may be easier than expected, since a price indicator already exists via the cost of emissions offsets, which CSU already purchases to be carbon neutral.

Within the fleet, this could be used to further influence rental choice. Higher-emission vehicles would attract a carbon emissions impost and would therefore be less competitive with lower emissions options.

# THE PATH AHEAD

## Alignment of other fleet policies

The rating scheme alone cannot optimise all aspects of fleet sustainability, because reducing one factor (e.g. carbon emissions) can affect other factors (e.g. air pollution). For this reason, other fleet policies may be required to support the rating scheme.

A simple example is the use of diesel fuel. Diesel vehicles tend to have lower $CO_2$ ratings than petrol engine vehicles. However, they also tend to have higher levels of pollutants in their exhaust. Basing the rating scheme purely on $CO_2$ emissions may therefore lead to a bias in favour of diesel-engine vehicles. If CSU wants to avoid this (for OH&S, policy, cost or other reasons), it will need to specify this in its procurement policies or vehicle eligibility lists.

A second example is the prioritisation of different vehicle features or attributes. All fleets assign different levels of importance to comfort, ergonomics, safety/crashworthiness, load capacity, fuel efficiency, and other vehicle attributes. Some of CSU's priorities and challenges were discussed on page 6.

It is important that the star rating be included as an additional criteria for evaluating new vehicle purchases if it is to be effective at changing behaviour and fleet sustainability over time.

## The big picture

Replacing one kind of vehicle with a greener one is just one path to improving fleet sustainability. Indeed, it can be more effective (and more cost-effective) to address other levels in the opportunity hierarchy. Avoiding trips (by video conferences or car pooling), using public transport or active transport, and driver training, are some obvious examples.

Other opportunities for reducing transport impacts were identified in the draft Clean Energy Strategy. These should be reviewed and considered as supplementary projects.

## More information

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MOV3MENT

transport energy environment

# APPENDIX A – Vehicle categories used by FCAI and NTC

| Passenger motor vehicles | Sports utility vehicles (SUVs) | Light trucks |
|---|---|---|
| Passenger vehicles are classified dependent on size, specification and average retail pricing.<br>Selected vehicle types will be assessed on footprint defined as length (mm) × width (mm), rounded, as follows: | Vehicles classified as SUVs meet the FCAI criteria for classifying SUV vehicles based on a 2/4 door wagon body style and elevated ride height. Vehicles typically will feature some form of 4WD or all-wheel drive; however, where a 2WD variant of a model is available it will be included in the appropriate segment to that model.<br>Selected vehicle types will be assessed on footprint defined as length (mm) × width (mm), rounded, as follows: | Vehicles designed principally for commercial use but may include designs intended for non-commercial applications. |
| **Micro**<br>Hatch, sedan or wagon with a footprint < 6,300mm² | **Small**<br>< 8,100mm² | **Light bus < 20 seats**<br>8+ seats, but less than 20 seats |
| **Light**<br>Hatch, sedan or wagon with a footprint range 6,301–7,500mm² | **Medium**<br>8,101–8,800mm² | **Light bus > 20 seats**<br>20+ seats |
| **Small**<br>Hatch, sedan or wagon with a footprint range 7,501–8,300mm² | **Large**<br>8,801–9,800mm² | **Van/cab chassis ≤ 2.5t**<br>Blind/window vans and cab chassis ≤ 2.5 t GVM |
| **Medium**<br>Hatch, sedan or wagon with a footprint range 8,301–9,000mm² | **Upper large**<br>> 9,801mm² | **Van/cab chassis > 2.5–3.5t**<br>Blind/window vans and cab chassis 2.5–3.5 t GVM |
| **Large**<br>Hatch, sedan or wagon with a footprint range 9,001–9,500mm² | | **Pick-up/chassis 4×2**<br>Two driven wheels, normal control (bonnet), utility, cab chassis, one and a half cab and crew cab |
| **Upper large**<br>Hatch, sedan or wagon with a footprint range > 9,501mm² | | **Pick-up/chassis 4×4**<br>Four driven wheels, normal control (bonnet), utility, cab chassis, one and a half cab and crew cab |
| **People movers**<br>Wagon for passenger usage, seating capacity > 5 people | | |
| **Sports**<br>Car, coupe, convertible or roadster | | |

National Transport Commission 2017, *Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2016,* Information Paper May 2017

# APPENDIX B – Average emissions intensity for different vehicle classes

| Segment | Average emissions intensity (g/km) | | Change from 2015 to 2016 (%) | Sales | |
|---|---|---|---|---|---|
| | 2015 | 2016 | | 2015 | 2016 |
| Small | 153 | 153 | -0.5 | 232,939 | 224,386 |
| SUV Medium | 179 | 174 | -2.8 | 144,937 | 172,194 |
| Pick Up/Chassis 4X4 | 230 | 222 | -3.3 | 134,003 | 146,528 |
| SUV Large | 220 | 212 | -3.9 | 139,734 | 142,495 |
| SUV Small | 168 | 158 | -5.9 | 111,275 | 110,414 |
| Light | 138 | 136 | -1.6 | 111,954 | 95,021 |
| Medium | 162 | 161 | -0.6 | 78,123 | 74,573 |
| Pick Up/Chassis 4X2 | 230 | 224 | -2.5 | 40,657 | 43,948 |
| Large | 227 | 235 | 3.5 | 43,940 | 39,392 |
| Sports | 174 | 197 | 13.0 | 22,905 | 27,464 |
| Vans/Cab Chassis | 216 | 213 | -1.2 | 20,993 | 23,812 |
| SUV Upper Large | 277 | 261 | -5.5 | 12,525 | 15,914 |
| People movers | 218 | 216 | -0.9 | 11,946 | 12,864 |
| Micro | 121 | 127 | 4.4 | 10,717 | 10,207 |
| Upper Large | 242 | 250 | 3.1 | 2,976 | 2,286 |
| Light buses | 260 | 259 | -0.5 | 2,685 | 2,155 |
| **Total** | **184** | **182** | **-1.1** | **1,122,309** | **1,143,653** |

National Transport Commission 2017, *Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2016,* Information Paper May 2017