Bus Industry Confederation Response to:
Vehicle emissions standards for cleaner air
Draft Regulation Impact Statement

May 2017

Contents

Executive Summary

The following is the Bus Industry Confederation's (BIC's) response to the Vehicle emissions standards for cleaner air Draft Regulation Impact Statement December 2016 as issued by the Department of Infrastructure and Regional Development (the Dept.).

Overall the BIC is supportive of the move to regulating Euro 6 for light vehicles and Euro VI for heavy vehicles under the Motor Vehicle Standards Act 1989 with a number of Australian bus suppliers already offering Euro VI products, as well as several high-profile government bus fleet's operating Euro VI buses.

BIC Responses to Specific Sections within the RIS

As stated, overall the BIC is supportive of the RIS, however the BIC wishes to provide the following comments and or additional information to specific sections within the RIS and these are provided in the following sections.

Options Explored in the RIS

Extract from the RIS relating to Option 6:

"Option 6 – Mandate both Euro 6 for light vehicles and Euro VI for heavy vehicles under the Motor Vehicle Standards Act 1989" [1]

BIC supports this Option but only if the new ADR does recognise the equivalent US or Japanese standards as alternatives to Euro VI, as is suggested in the RIS as per the following:

> *"Similar to ADR 80/03, ADR 80/04 may also allow for equivalent US or Japanese standards as alternatives to Euro VI. Specific feedback on this will be sought from the heavy vehicle industry during public consultation."*[2]

Given that a sizable percentage of the bus chassis offered in Australia use either Japanese or US sourced drivelines, the BIC believes it is essential that the ADR recognises the equivalent US or Japanese standards as alternatives. To this end, the BIC would be more than happy to work through the technical detail with the Dept. on this matter.

Benefit-Cost for Option 6

Extract from the RIS regards the highest Cost Benefit outcome:

> *"The benefit-cost analysis of option 6–mandating both Euro 6 and Euro VI for light and heavy vehicles–estimated a net benefit of $675 million over the period 2016 to 2040."*[3]

The benefit-cost analysis for mandating Euro VI standards for heavy vehicles is estimated a net benefit of $675 million over the period 2016 to 2040. The BIC considers that this is a very low return given the timeframes and assumptions used in the RIS, but the BIC still supports moving to the higher emission standards.

[1] RIS page 6

[2] RIS page 26

[3] RIS page 6

RIS Maintenance Cost Assumptions

In the RIS, the costs of introducing Euro VI were assessed on the basis of capital costs, fuel costs, urea costs, productivity losses, greenhouse gas emissions, and the benefits were assessed on the basis of avoided health costs. Increased maintenance costs were ignored as the figures were considered unreliable, the statement in the RIS being:

> *"The analysis focused on the benefits and costs that could be reliably quantified. Some possible costs were omitted from the analysis (such as maintenance costs) due to limited information and/or methodology to reliably estimate them, as well as some likely benefits (such as a reduction in secondary particulates and black carbon emissions) also being omitted due to methodological limitations. Some assessments of these possible additional costs and benefits were conducted in sensitivity analyses."*[4]

The BIC agrees that due to the relatively small number of euro VI buses in service, there is limited information regards the real in-service costs of operating Euro VI buses, but it needs to be recognised that the technology will create added maintenance costs. These costs will be due to:

- The AdBlue systems which include fillers, tanks, controllers and pumps, plus AdBlue is extremely corrosive to metal alloys and electrical harnesses. These factors will increase the overall maintenance costs.
- The complexity of the exhaust system is also increased with its AdBlue injection system and catalytic converter are added items that will need to be maintained.
- Also the above systems add heat into the buses engine bay and over time this added heat generates a range of issues that will increase the maintenance costs, items such as cooling systems, electrical harnesses and even the engine bay insulation degrade at a faster rate.

The RIS provides a sensitivity analysis for maintenance costs and even small changes on the maintenance cost had a large impact on the benefit-cost ratio, however the RIS provides little detail into how the returns were actually calculated.

The RIS did make the following statement:

> *"When combined, these factors led to a rough estimate for average maintenance cost increases of $300 per vehicle in 2017, with a reduction in maintenance costs over time due to a learning scale factor."* [5]

The BIC disagrees with this statement, the added technologies involved with Euro IV will increases maintenance costs above the estimated $300 per vehicle in 2017 and to say that these costs will reduce over time due to *a "learning scale factor"* is simply not true. Over time the AdBlue equipment, or alternative technologies, will deteriorate over time and this componentry will need to be serviced and or replaced. This will increase costs over time, not reduce them as stated in the RIS.

[4] RIS Page 61

[5] RIS Page 80

RIS Fuel and AdBlue Usage Assumptions

The RIS makes some assumptions in relation to AdBlue consumption, firstly that the typical Euro V urea consumption is between 2 to 5 % and BIC wishes to confirm that this is a responsible assumption. The statement in the RIS being:

> *"Adoption of the Selective Catalytic Reduction technology will involve use of urea (Diesel Exhaust Fluid or AdBlue), where the typical use of urea solution is equivalent to between about 2–5 per cent of total diesel consumption, depending upon the particular technology implementation. The price of urea is similar to that of diesel, although it has been subject to more fluctuation (ICCT 2013).*
>
> *The available evidence suggests that Euro VI heavy vehicles will generally have lower urea consumption than Euro V heavy vehicles."*[6]

However, the next assumption in the RIS is that Euro VI buses will have lower urea consumption than Euro V buses is incorrect, to meet the higher emission standards the urea consumption will increase above 5 to possibly 6–7 %.

The RIS also assumes an increase in fuel consumption of only 0.5 to 1% when progressing from Euro V to Euro VI as per the following:

> *"The fuel costs were calculated by assuming that the fuel consumption of a Euro VI heavy vehicle would be 0.5-1 per cent higher than an equivalent Euro V vehicle due to the heavier vehicle mass and the use of Exhaust Gas Recirculation systems which tend to be less fuel efficient.*
>
> *The diesel exhaust fluid costs were calculated by assuming that a move to Euro VI would entail more vehicles using urea than the base case, but with reduced rates of urea consumption per vehicle."*

The assumed increase of only 0.5-1.0 % is definitely a very conservative number, but again the assumption is made that urea consumption rates will reduce and this assumption is incorrect. Therefore, BIC believes that the RIS does not correctly predict costings associated with fuel and urea consumptions.

RIS Tare Mass Assumptions and Capacity Effects

The RIS does assume a tare mass increase of 300 kg[7] and BIC supports this assumption, but BIC totally rejects the assumption that the tare mass increase does not affect passenger capacity.

The RIS includes the following footnote on this issue:

> *[54] It appears that there is a lack of sufficient evidence to support the claim that introduction of Euro VI standards will necessarily lead to a loss in seating capacity. For example, ACTION recently ordered from Scania 77 rigid buses which meet the strict Euro VI emissions standard. Scania tendered the same seating capacity for Euro VI as for Euro V in its tender response for rigid buses, that is, for ACTION there would be no loss of seating capacity. The number of standees tendered by Scania was also within ACTION's tender requirements.*

This comment is technically incorrect as it assumes that the seated and standing capacities set by ACTION in their tender were the maximum legal capacity for the tendered buses.

The buses referred to in the footnote are Low Floor 12.5 m Scania K320UB Euro VI chassis with Custom Bus CB80 bodies and they have a passenger capacity of 48 seated and 18 standing or 66 passengers in total.[8] The 18 standing passengers quoted is the standing limit that suited ACTION's operations, it is not the maximum a bus can carry.

---

[6] RIS Page 72

[7] RIS Page 72

[8] https://www.transport.act.gov.au/getting-around/bus-services/action-info/action_fleet

Table 1 provides the true effects of the tare increase of 300 kg and as is seen the tare increase reduces passenger capacity by 4 or 5 passengers depending on bus type and basic tare mass, noting that the table considers a range of base tare masses that cover the buses currently available in the market place.

Therefore, BIC seeks further discussion with the Dept. on this issue as the BIC sees the assumptions on passenger capacity as fundamentally flawed.

Table 1 - Two Axle Bus Mass Analysis

Two Axle Buses	***Current ADR Processes***			***Proposed Gazette Change to 80 kg per person***		
	Based on Typical Current Tare Masses in kg for Euro 5 buses			***Based on Typical Tare Mass Euro 6 (see note 2)***		
	Two Axle Low Floor Bus	High Floor No Seatbelts	High Floor with Seatbelts and Luggage	Two Axle Low Floor Bus	High Floor No Seatbelts	High Floor with Seatbelts and Luggage
Typical Tare Mass Euro 5 and Euro 6	11300	11400	11500	11600	11700	11800
Gross Limits, (see note 1).	16000	16000	16000	16000	16000	16000
Effective Carrying Capacity	4700	4600	4500	4400	4300	4200
Passenger Mass	65	65	65	65	65	65
Luggage Allowance per Passenger Mass (see note 3)	0	0	15	0	0	15
Theoretical Gross Number of Passengers, (see note 4).	72	71	56	68	66	53
Maximum Potential Increase in Number of Passengers based no ideal mass distribution (see note 5).				-5	-5	-4
Maximum Potential Increase in the Tare of the bus based ideal Mass distribution (see note 5).				-392	-392	-319

Notes for Two Axle Buses
Note 1: Current Axle Limits based on State Regulations.
Note 2: Add 300 kg to the tare mass of each bus to account for Euro 6 plus general tare increases.
Note 3: Luggage increases as per ADR.
Note 4: To determine maximum increases, it is assumed that the passenger masses can be distributed throughout the bus such that the full gross limit of 16 Tonne can be fully utilised. Plus, the per passenger standing area requirement of 6.25 persons per square metre has not been exceeded.
Note 5: As stated in note 3 the results provided are based on ideal mass distributions, were such ideal distributions cannot be achieved, hence the real-life increases may be less than the figures provided but it is considered that there would be sufficient spare gross capacity that the total passenger capacity would not reduce.

RIS Proposed Timing

The BIC supports the proposed timing in the RIS for a Euro VI implementation period of 2019 for new heavy vehicle models and 2020 for all new heavy vehicles[9].

However, BIC has concerns, as expressed in the past, about the problems faced by bus chassis manufacturers and bus body manufacturers in relation to the "crystal balling" of the market to determine the number of chassis they should import, and have in stock, when new ADRs are introduced that set an implementation date that simultaneously introduces a new vehicle/model to the market place.
Currently the vehicle certification process for buses demands that a vehicle be fully built and ready for service before it can be "ADR plated".

This requirement and the introduction of new vehicle emission standards sees bus and coach manufacturers having to complete vehicles as stock vehicles with "*standard"*[10] seating configurations installed so that the bus can be ADR plated by the emission change over date.

Due to the large variations in bus operational conditions, such as school services, route bus or charter services, the industry practice for stock buses is that the seats are left out until a customer is found for the stock bus and then the seats are fitted to meet that customer's specific operating requirements. If seats are fitted before the intended customer is known, there is no certainty that the vehicle can be sold with the "*standard"* seating configuration in place, typically what happens is that the "*standard"* seating has to be removed and replaced with the customer specified seating.

The BIC would like to propose an alternative approach be adopted by the Federal Government.

The BIC would like to propose that buses and coaches be allowed to be built and pre-plated "without seats". Once the seats are fitted, the bus could then be fully and correctly plated in accordance with the final seating arrangements.

Rules would be required to ensure that Chassis were not flooding the market to take advantage of these proposed changes: some suggestions of rules are as follows:

a) Chassis must have arrived prior to say September 30 of the relevant year for new models and all new vehicles and have documentary evidence of the arrival date.

b) Completed vehicles must have arrived prior to say December 15 of the relevant year with documentary evidence of the arrival date.

c) All units must be completed by say 31st June of the following relevant year.

d) These standards apply to vehicles with a seating capacity of 30 to 61 seats utilised in school, charter, tourism and city and town route bus services.

The suppliers within the bus and coach industry have already taken steps to aid the transition to the new Euro VI standard and some already offer Euro VI in the Australian market. In taking this step the positive impact on emissions is already being realized.

The BIC seeks the support of all jurisdictions for this approach for the bus industry and BIC would then be happy to work through the details of such a process with the Dept.

RIS bus Age Assumptions

The RIS assumes a bus medium bus life of 20 years and the BIC supports this assumption. But BIC also wishes to provide the Dept. with additional information in relation to bus fleet ages and also predicted bus replacement rates. Therefore, we would direct the Dept. to review Attachment A which is a copy of the presentation made by the BIC on these topics at the 2017 BIC Technical Summit.

---

[9] RIS Page 6

[10] The reality is that there is no standard seat configuration until it is known what work the bus will be used for such as will it be a school, charter or route type bus and this is only known once the customer is confirmed.

BIC National Technical and Suppliers Summit
12:15 Tuesday February 28, 2017

SESSION 6:
Review of Australian Bus Fleet

Bus Industry Confederation
MOVING PEOPLE

Bus Australia Network

BIC Bus Industry Confederation moving people
busnsw
BusSA Bus & Coach Association SA
BusVic Bus Association Victoria
QBIC
TasBus

Session 6: Australian Bus Fleet Data

The following data was obtained from the Australian Bureau of Statistics, specifically:

- ***The Motor Vehicle Census, 2013.***
- ***The Motor Vehicle Census, 2014.***
- ***The Motor Vehicle Census, 2015.***
- ***The Motor Vehicle Census, 2016.***

The motor vehicle census publication presents statistics relating to vehicles which were registered on 31st January of each year with a motor vehicle registration authority.

Session 6: Australian Bus Fleet Data

Statistics are provided all vehicle types and buses the categories are:

- **Buses 2 Axle over 4.5 to 12T GVM.**
- **Buses 2 Axle over 12T GVM.**
- **Buses 3 Axle over 12T GVM.**
- **Buses/Artic 3 Axle over 12T GVM.**
- *Buses 3 Axle over 4.5 to 12T GVM (Zero Data).*
- *Buses 4 Axle over 12T GVM (Zero Data).*
- *Buses/Artic 4 Axle over 12T GVM (Zero Data).*

These categories are also segregated by a range of items such as age, seating capacity, model, make and postcode.

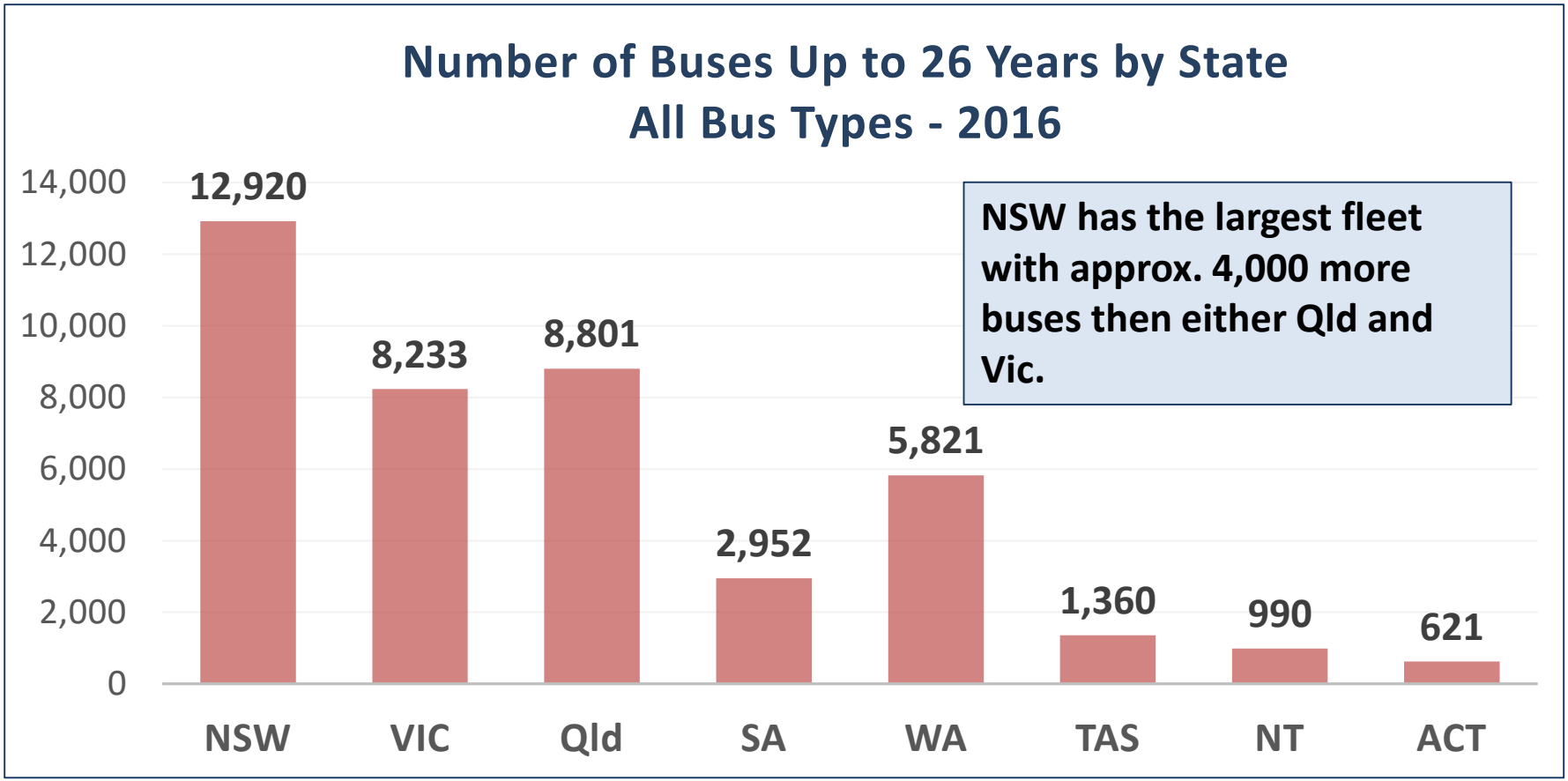
Session 6: Australian Bus Fleet Data

The data reviewed was based on the following:

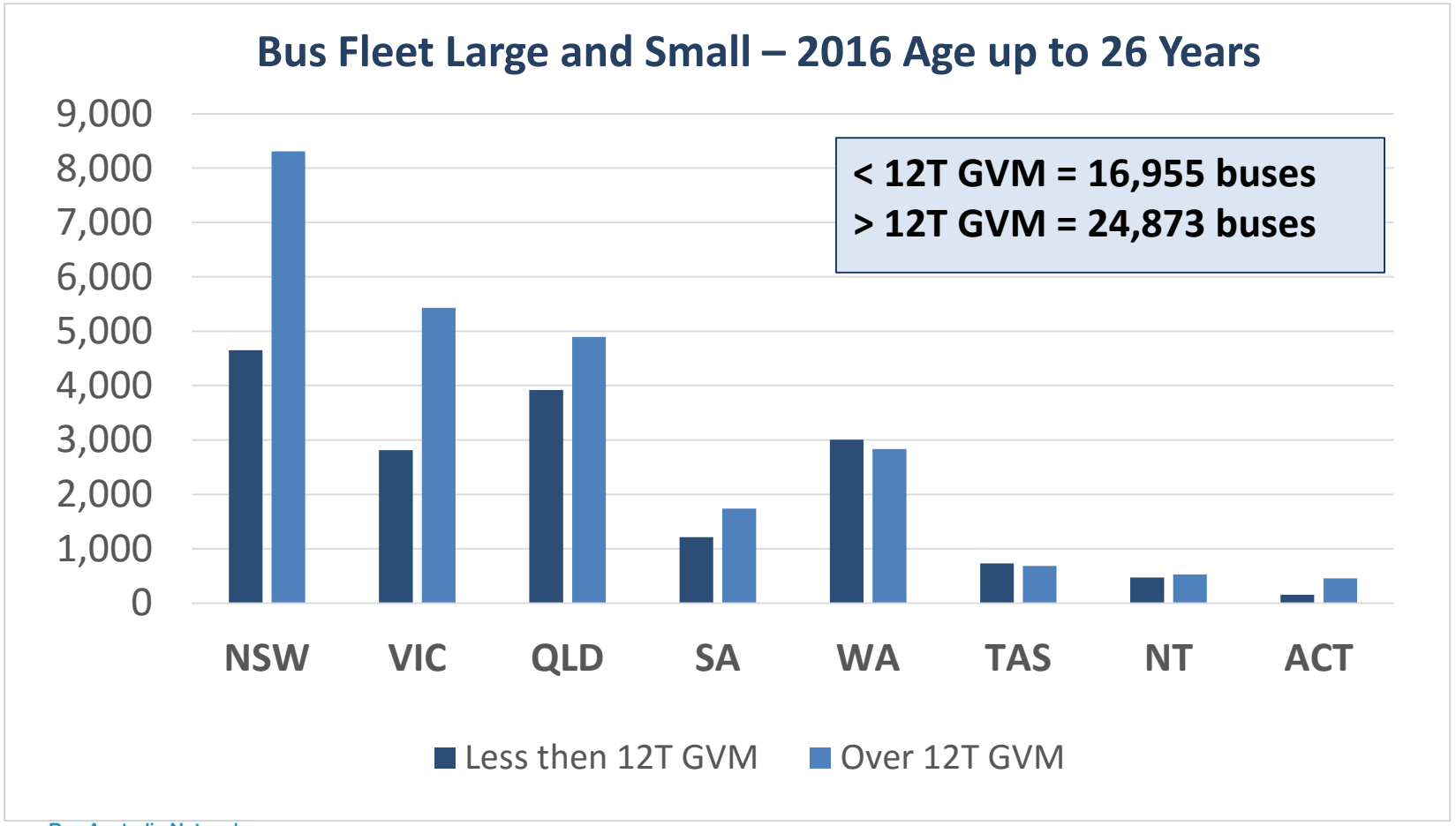
- All bus sizes (excluding the zero data).
- For all States and Territories
- For buses from 1 and up to 26 years.
- There are buses listed older then this, but most contracts set a max of 25 years.

(Note: There is no segregation of buses and coaches).

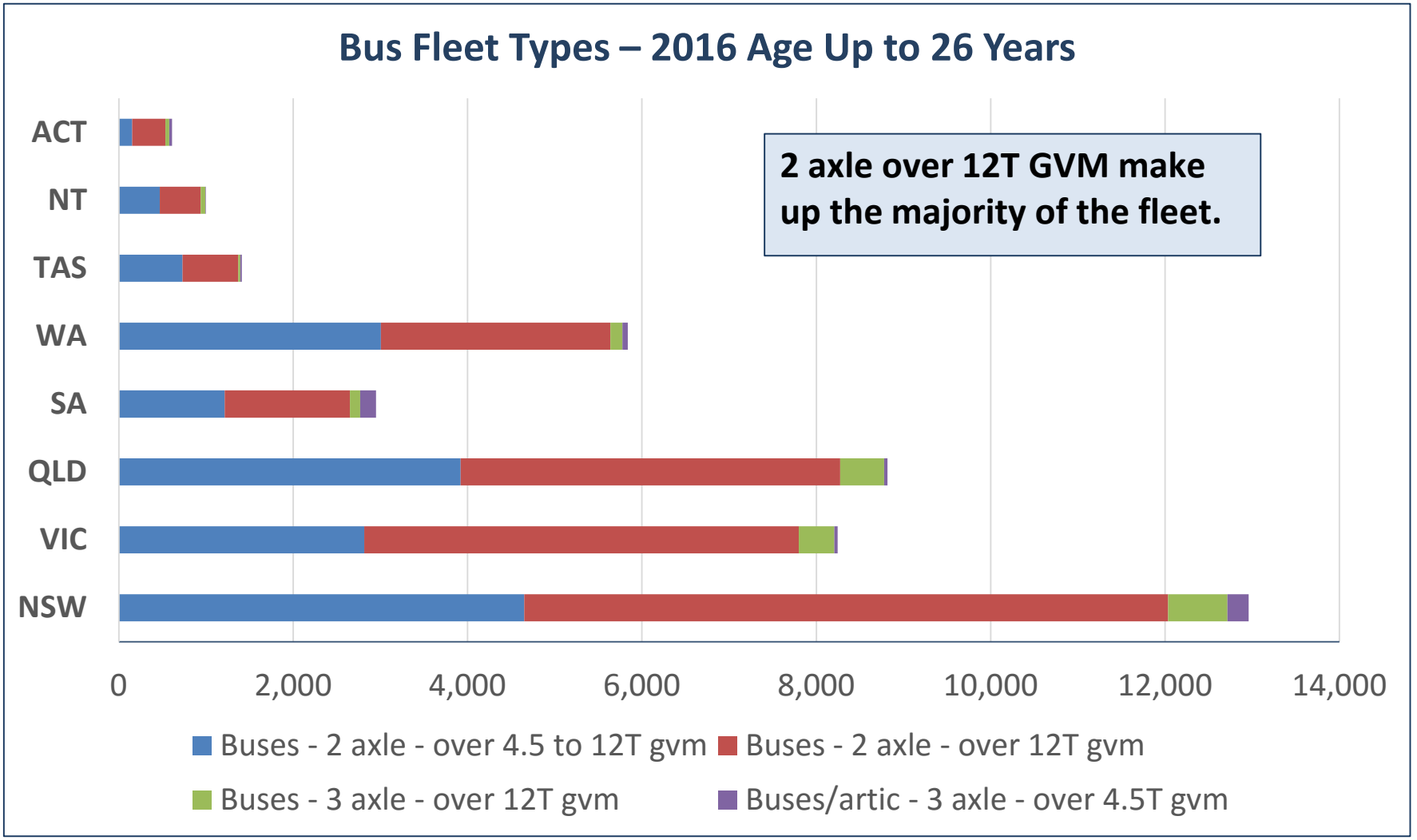
Total Number of Buses up to 26 Years of Age



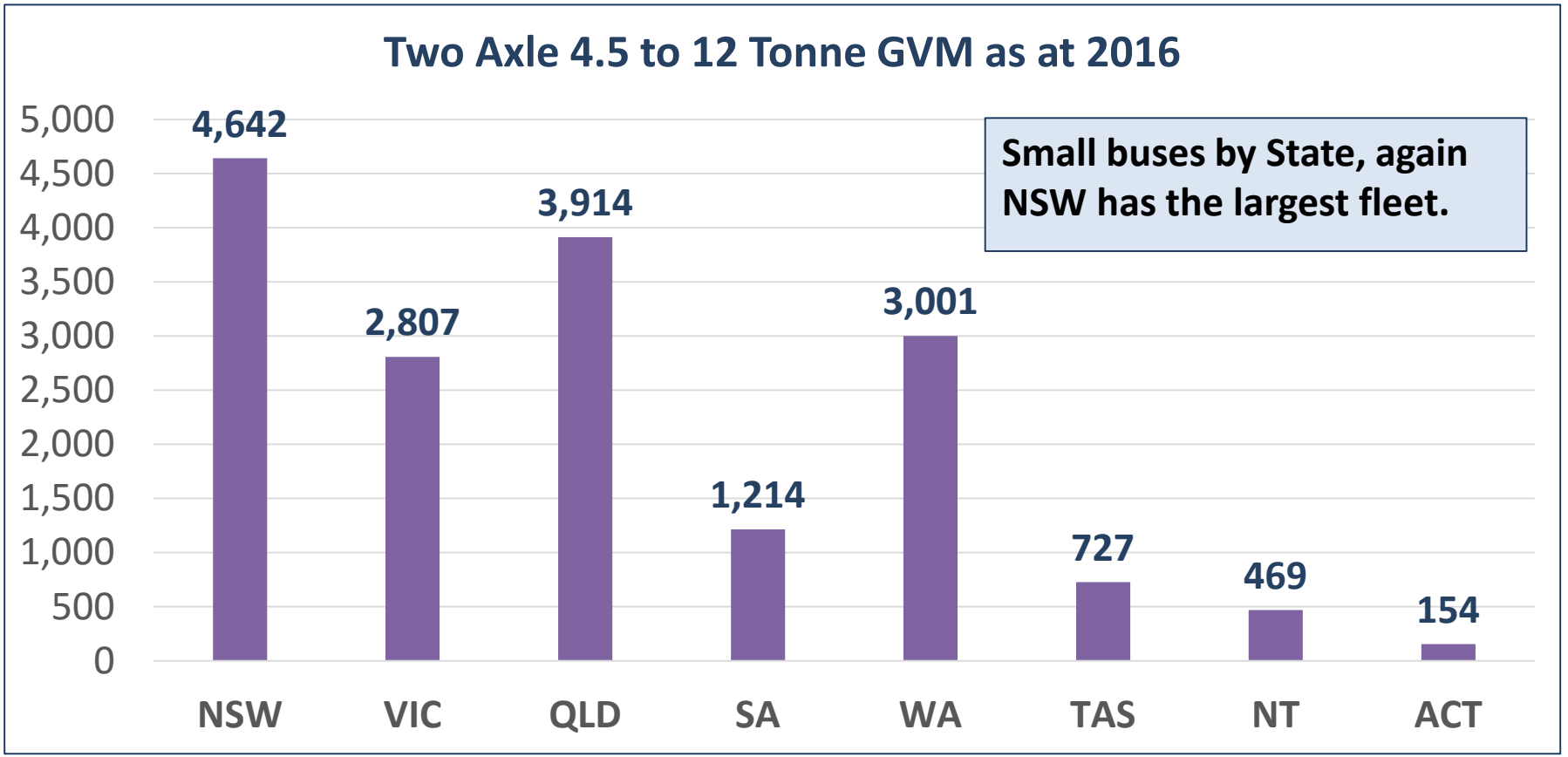
Large and Small Buses up to 26 Years of Age



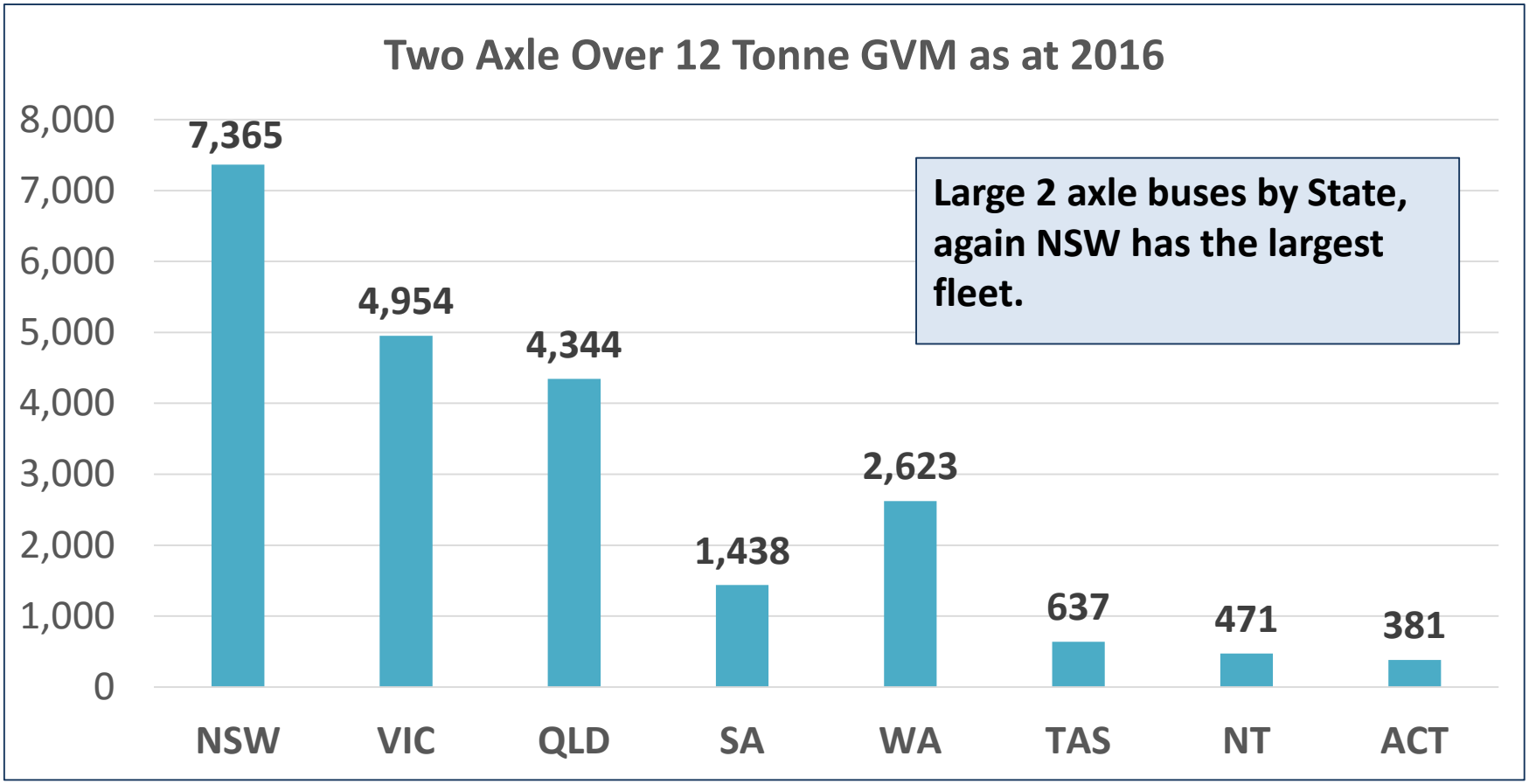
Buses by Type up to 26 Years of Age



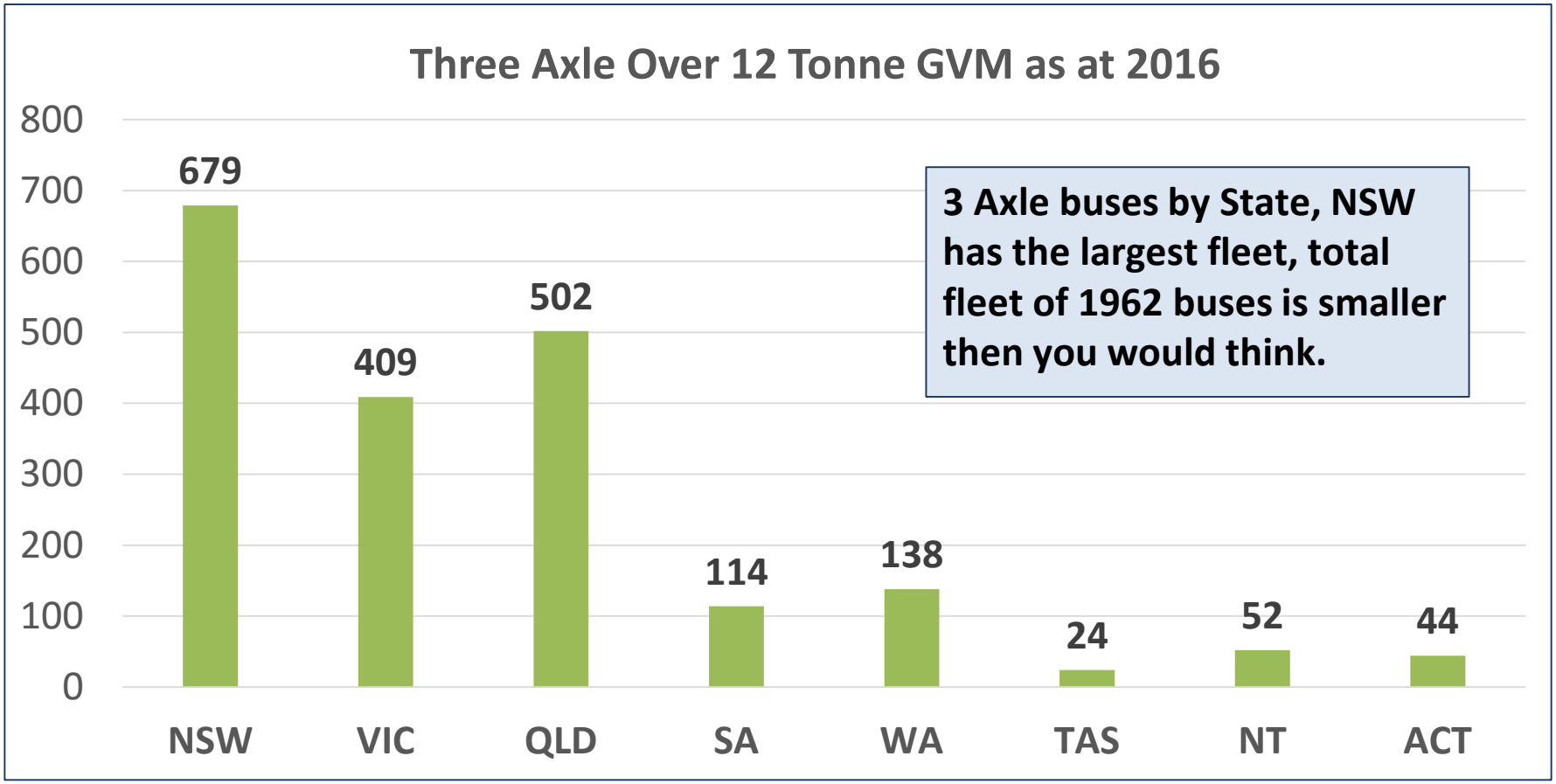
2 Axle 4.5 to 12T Buses up to 26 Years of Age



2 Axle Over 12T Buses up to 26 Years of Age

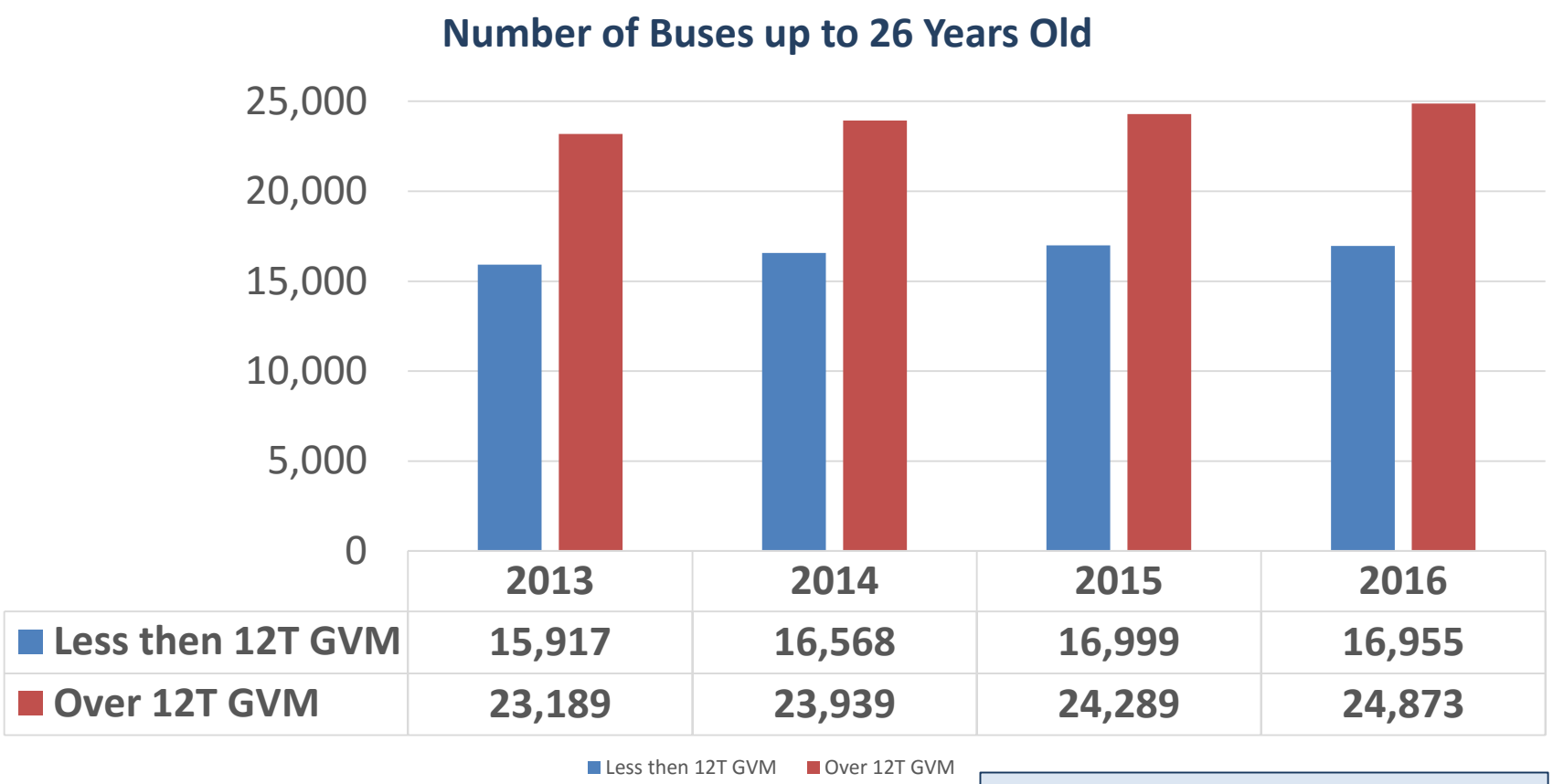


3 Axle 12T Buses up to 26 Years of Age



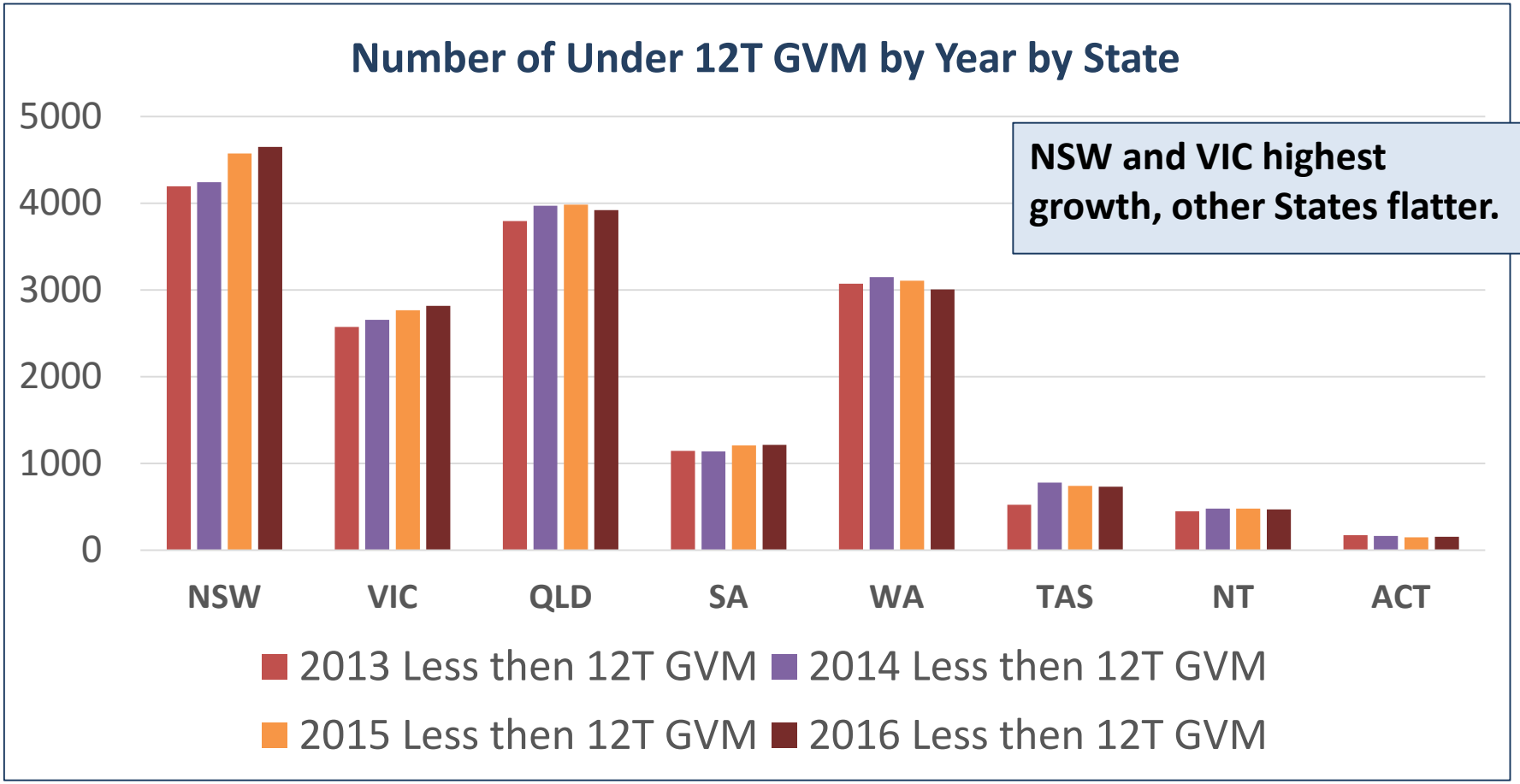
Bus Australia Network

Fleet Size over Time Buses up to 26 Years of Age

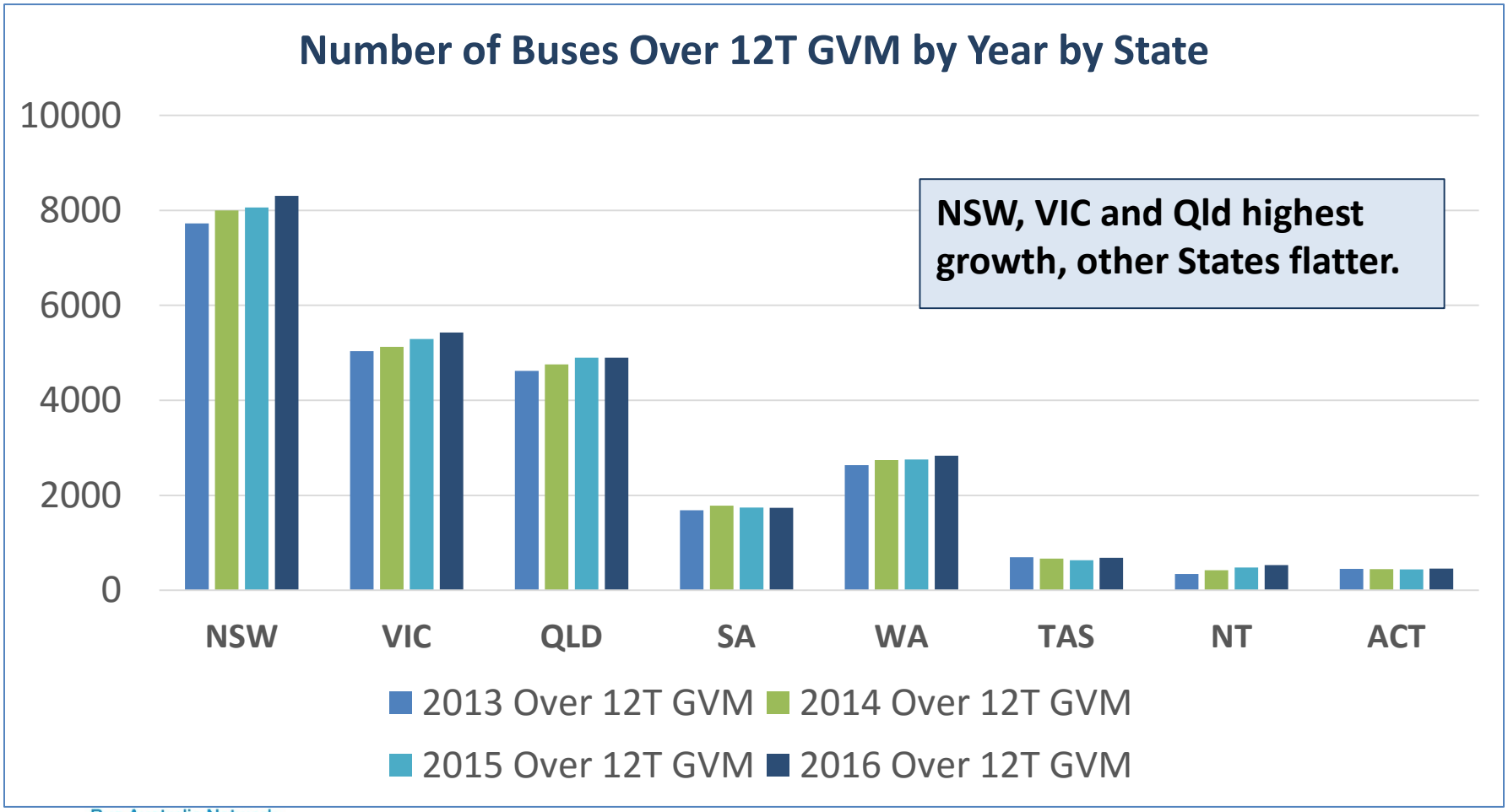


Increases in both Large and Small bus fleet size.

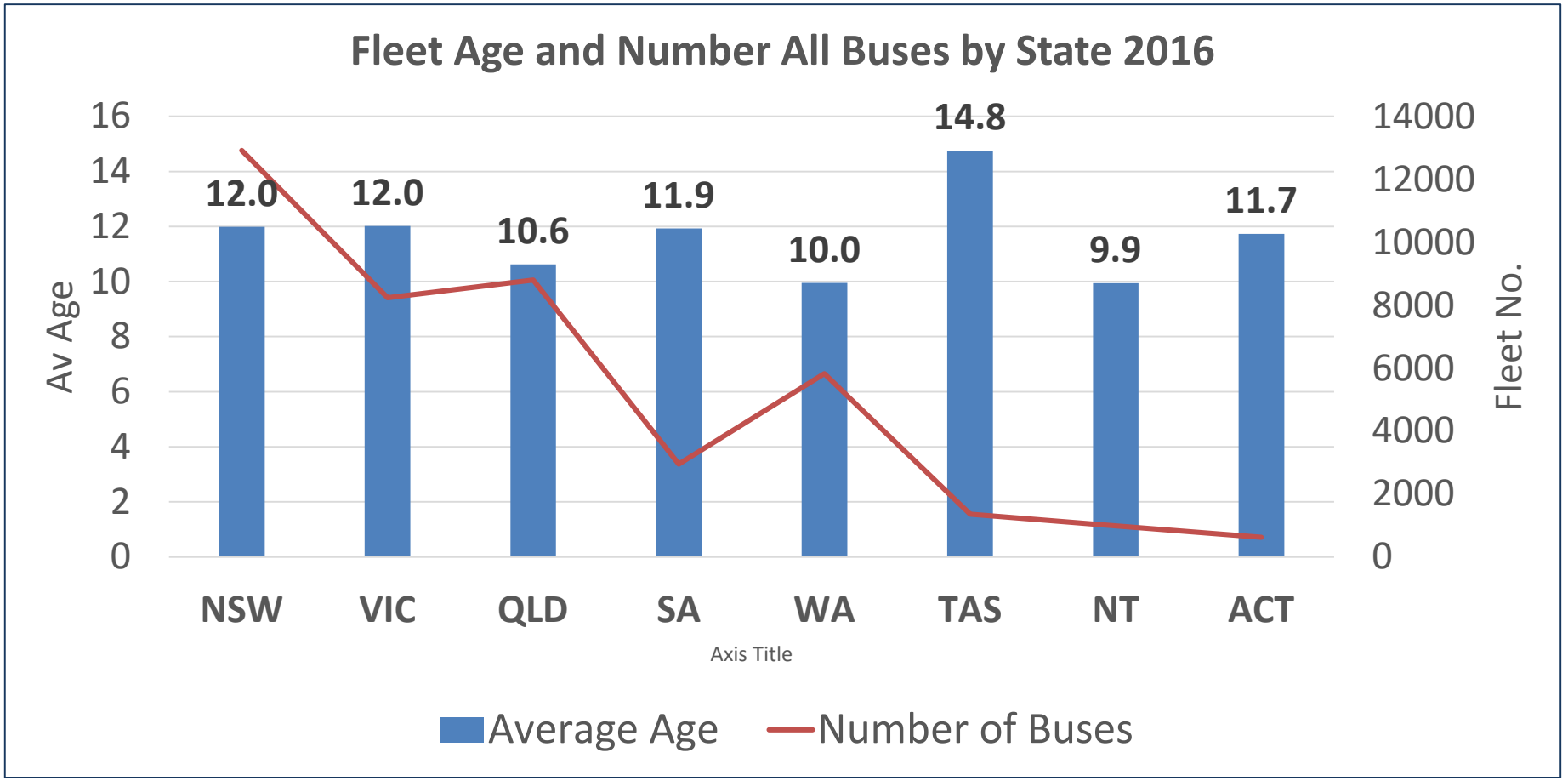
Under 12T Buses Growth by State up to 26 Years of Age



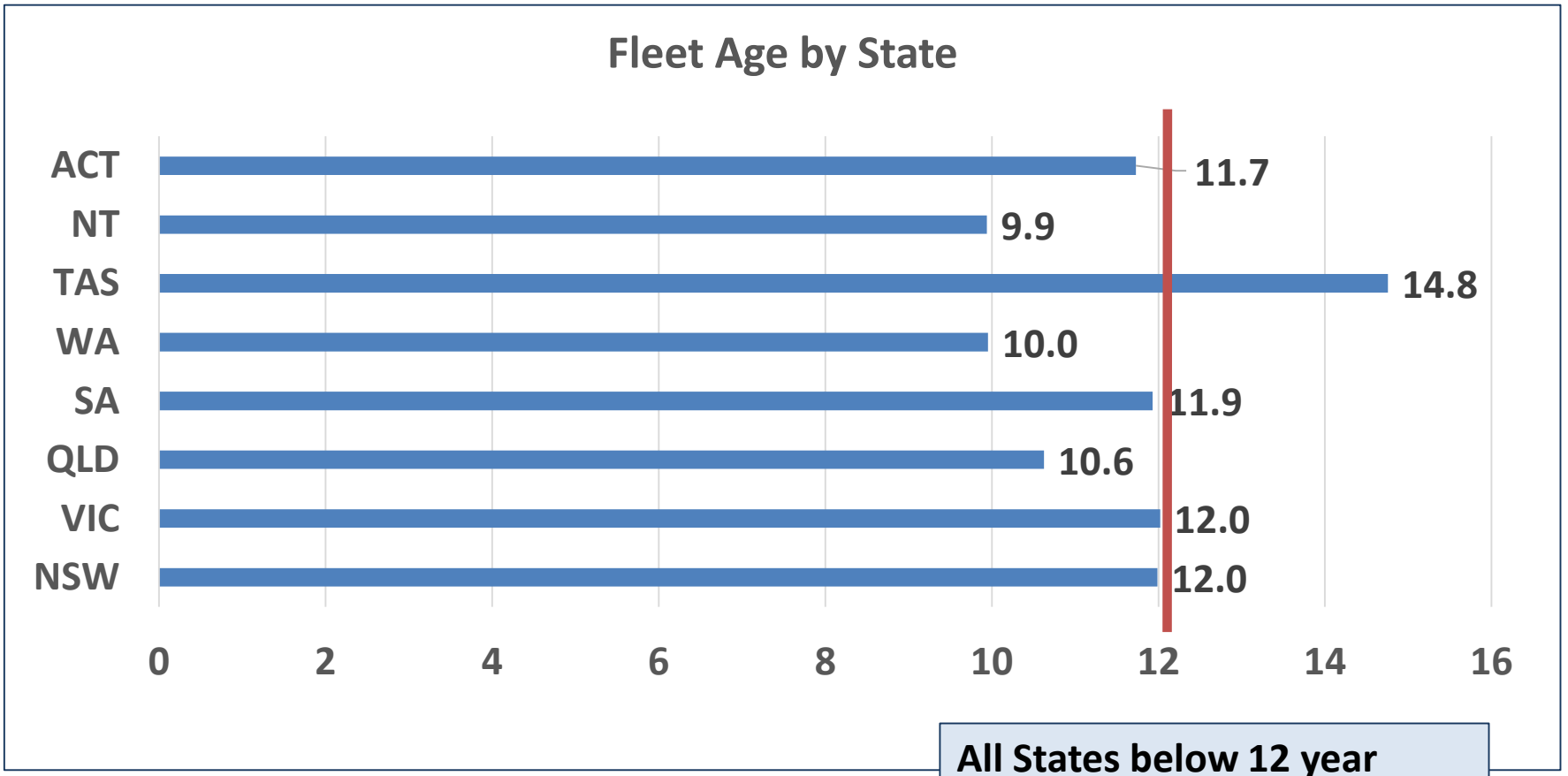
Over 12T Buses Growth by State up to 26 Years of Age



Average Fleet Age by State up to 26 Years of Age



Average Fleet Age by State up to 26 Years of Age



All States below 12 year average except TAS.

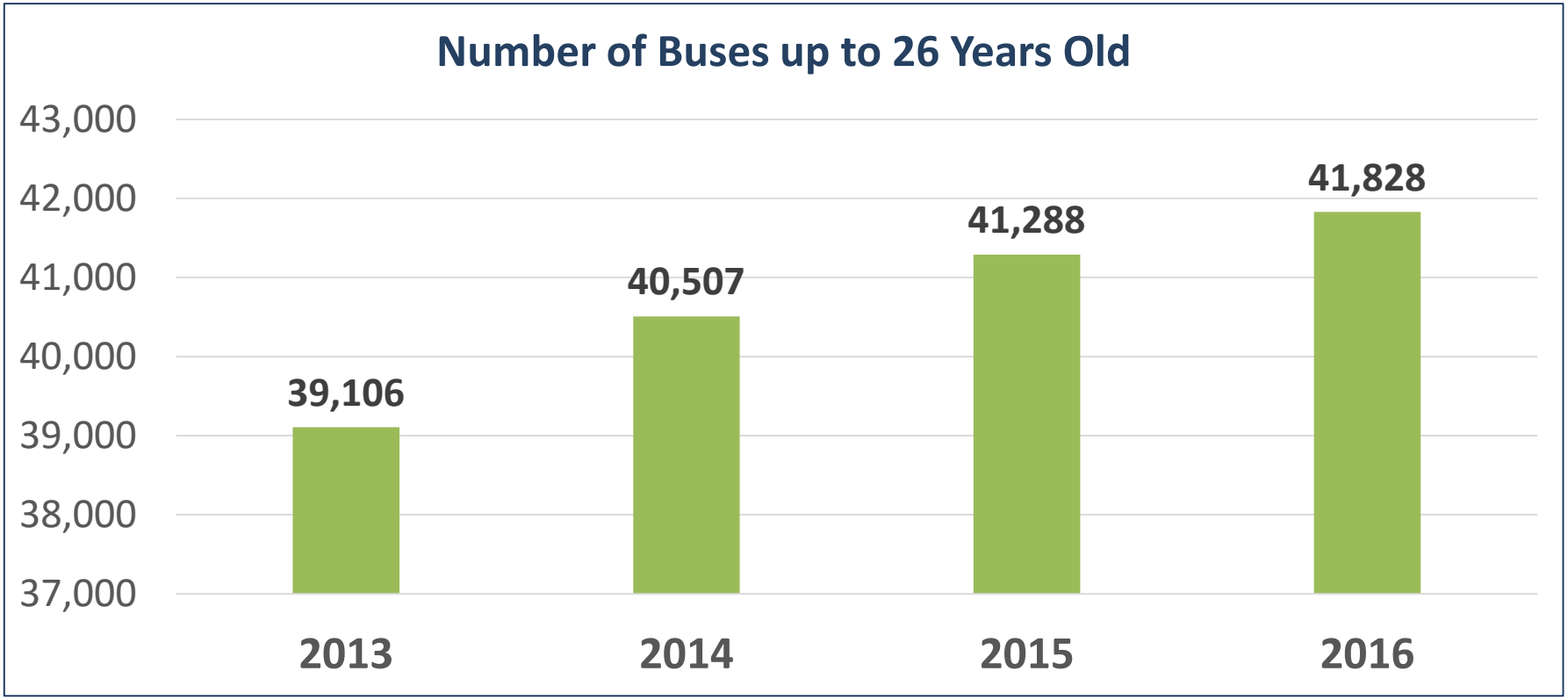
Fleet Replacement Numbers

There are two factors that help drive fleet replacement programs:

- Firstly State Regulations and/or Operating Contract Conditions and,
- Secondly the need to purchase additional or growth buses.
- Contracts and regulations vary and also depend on bus size, but generally the requirements are:
  - *An Average Fleet Age of 12 years and,*
  - *A Maximum individual bus age of 25 years.*
- The amount of additional buses varies greatly, but for the combined Australian fleet for all bus types up to 26 years of age, the average year on year growth is just over 2%.

Fleet Replacement Numbers

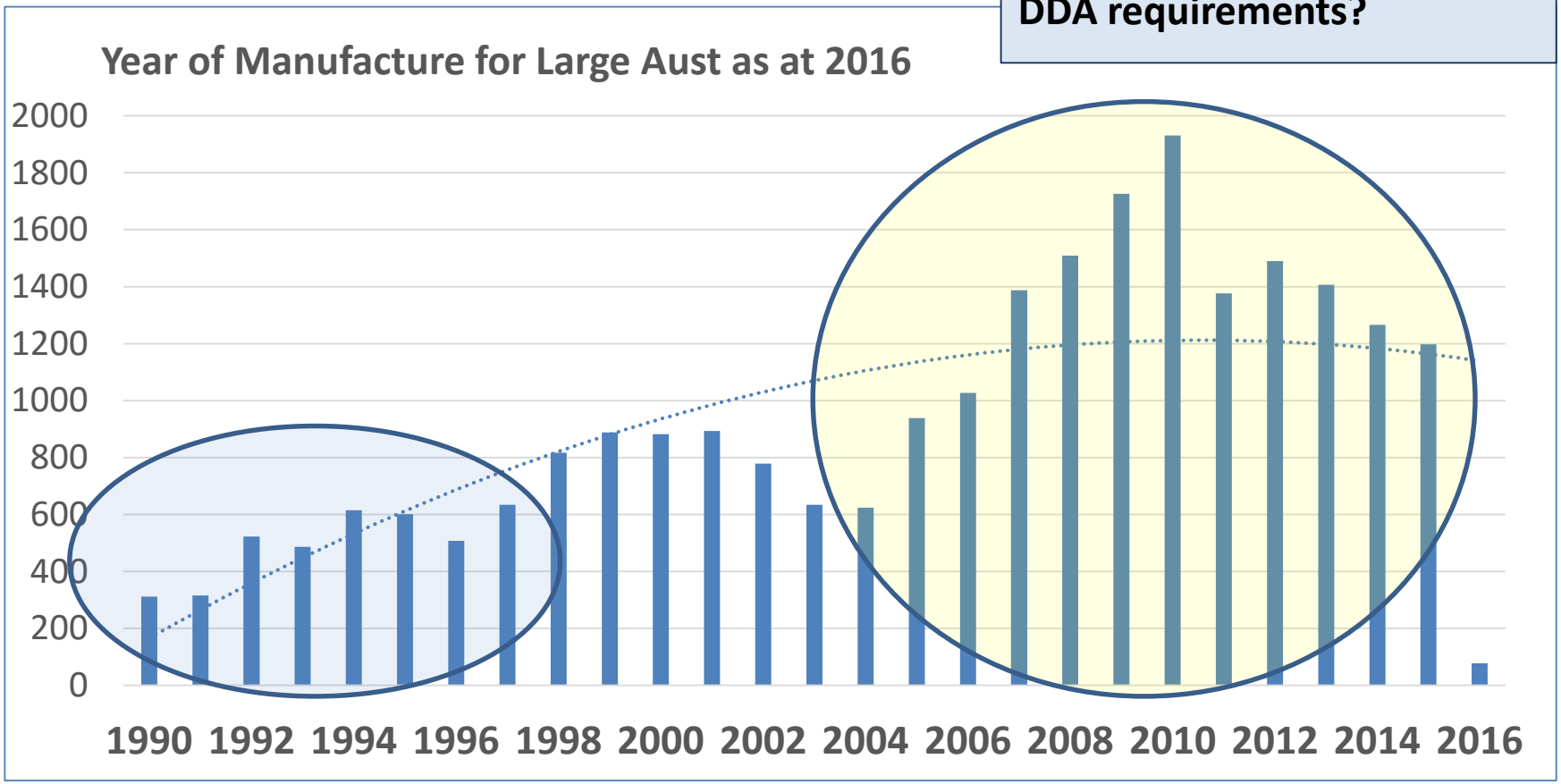
Below Equates to An Average fleet growth of 2.27%.



Fleet Replacement Numbers Fleet Age Spread

Older non-DDA buses that will reach the 35 year max.

The majority of the large bus fleet are post 2000 due to DDA requirements?



Fleet Replacement Numbers

- The major States are generally near the required average of 12 years, therefore the maximum bus age of 25 years would have a large effect on fleet replacement.
- The Table shows the buses that go over the age limit by State for the next 5 years.

Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total	Comment
Plus Year 1	170	58	68	30	48	67	13	22	**476**	Into 26 Year Age Bracket in 2017
Plus Year 2	148	70	79	51	67	52	10	37	**514**	Into 26 Year Age Bracket in 2018
Plus Year 3	262	152	120	58	66	74	12	48	**792**	Into 26 Year Age Bracket in 2019
Plus Year 4	332	126	93	80	76	74	25	5	**811**	Into 26 Year Age Bracket in 2020
Plus Year 5	393	176	146	108	77	101	16	25	**1042**	Into 26 Year Age Bracket in 2021

Fleet Replacement Numbers Over 12T GVM

- Combining the number of buses that go over the 25 year limit,
- And the assumed additional buses for an average growth of 2.2%.
- The number of bus purchases would look something like this:

Year from 2016	Replacement Buses	Additional Buses at 2.2%	Total Estimate per Year
Plus Year 1	**476**	**565**	**1041**
Plus Year 2	**514**	**577**	**1091**
Plus Year 3	**792**	**591**	**1383**
Plus Year 4	**811**	**604**	**1415**
Plus Year 5	**1042**	**618**	**1660**

Fleet Replacement Numbers over 12T GVM

- But the percentage of fleet growth has a major effect on the numbers, below shows the data for 3% and also 1%.

Year	Replacement Buses	Additional Buses at 3.0%	Total Estimate
Plus Year 1	**476**	**746**	**1222**
Plus Year 2	**514**	**769**	**1283**
Plus Year 3	**792**	**792**	**1584**
Plus Year 4	**811**	**815**	**1626**
Plus Year 5	**1042**	**840**	**1882**

Year	Replacement Buses	Additional Buses at 2.2%	Total Estimate
Plus Year 1	476	**249**	**725**
Plus Year 2	514	**251**	**765**
Plus Year 3	792	**254**	**1046**
Plus Year 4	811	**256**	**1067**
Plus Year 5	1042	**259**	**1301**

Fleet Replacement Numbers Over 12T GVM

- So a large bus market of 1,100 to 1,600 or more is likely.
- And the 1,400 buses per year market is a real target.

Year from 2016	Replacement Buses	Additional Buses at 2.2%	Total Estimate per Year
Plus Year 1	**476**	**565**	**1041**
Plus Year 2	**514**	**577**	**1091**
Plus Year 3	**792**	**591**	**1383**
Plus Year 4	**811**	**604**	**1415**
Plus Year 5	**1042**	**618**	**1660**

End of Presentation