



Zero Emission Bus Harmonised Specifications

Bus Industry Consultation

July 2025



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The Bus Industry Confederation

The Bus Industry Confederation (BIC) is the national independent peak body for the Australian Bus and Coach Industry. We represent over 160 bus and coach operators, body, chassis and complete bus manufacturers and suppliers, parts and service providers, professional services, and state bus associations on issues of national importance.

Our membership is becoming increasingly diverse as key energy and infrastructure partners join as we transition the fleet to low and zero emissions. The BIC advocates on behalf of our members to federal, state and territory governments and associated bodies, to ensure the safe and efficient carriage of passengers, along with safe and sustainable operations and supply chains that support the industry.

About Buses

Buses serve as mass transit, delivering benefits like reduced congestion, lower pollution, and enhanced productivity, as well as providing critical social mobility through frequent local routes. These benefits extend to improved public health, lower crime rates and better overall social outcomes, resulting in reduced costs for health and legal systems. The Australian bus industry is uniquely positioned to lead the transition to zero-emission technologies¹. for heavy vehicles, .assisting decarbonising strategy for the nation.

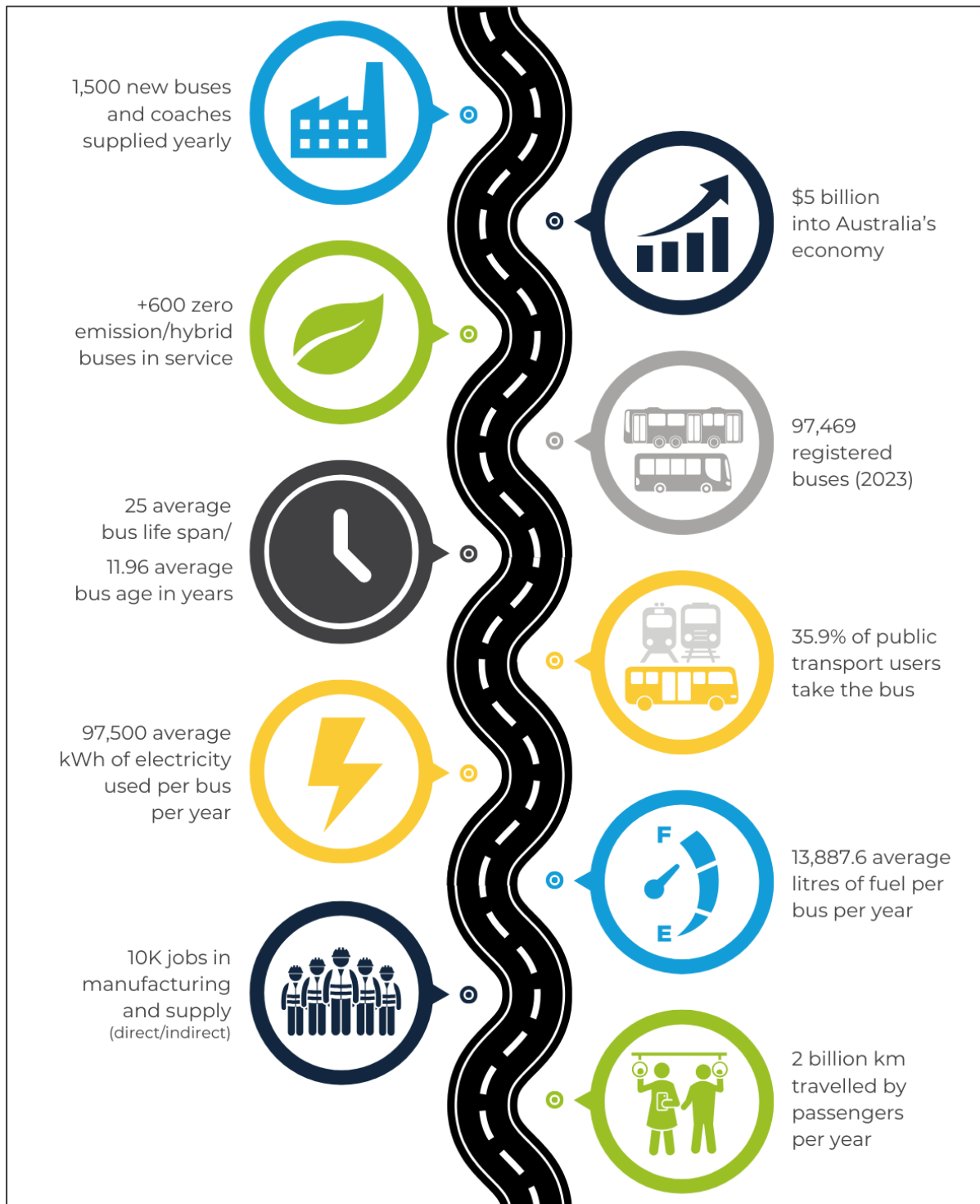
Buses have a strong and diverse manufacturing, and supplier presence in Australia providing **10,000 direct and indirect jobs** in Australia. This encompasses full manufacturers, assemblers, importers, component manufacturers, suppliers, and importers. We provide an **economic contribution \$5Billion** yearly to the Australian economy.

Buses provide a cost-effective role in moving people from and to their destinations every day, whether it is dense urban outer urban, regional, remote, or interstate. For example, in outer suburban areas, where other mass transit options are scarce, buses are vital in addressing poverty, disadvantage, and the financial strain of car ownership. They offer essential mobility to communities facing isolation, poor services, and socio-economic challenges.

Buses - The essential public transport carrying Australia.

¹ BIC Policy Paper – [Driving towards Zero Emissions](#)

Industry Snapshot | 2025



Response

The Bus Industry Confederation (BIC) welcomes the opportunity to provide input to the *National ZEB Harmonisation Working Group's* Industry consultation on Zero Emission Buses: proposed nationally consistent set of minimum requirements for a base model bus. We value the good working relationship to further work to a harmonised outcome.

Executive Summary

Industry feedback strongly supports the overall initiative by the *National ZEB Harmonisation Working Group* for a proposed high level ZEB standard.

Respondents feedback which represented more than 75% of the bus industry, encompassing both operators and suppliers, reflect stakeholder support for national consistency in standards across vehicle design, safety, performance and weights (mass).

There is a strong preference for aligning with established international standards — particularly in areas of fire safety, braking and energy use — rather than developing bespoke jurisdictional requirements.

Stakeholders also emphasise the importance of practical, real-world applicability standards, especially in areas such as battery performance, HVAC testing, and vehicle weight limits.

The responses not only summarised specific elements of the proposals, but they also offered solutions for which industry and government can collaborate on. The top four areas recommended for further consideration were:

- *Design life,*
- *Battery Range,*
- *Warranty Metrics,*
- *Vehicle Mass Limits.*

Please refer to the finding for the recommendations in these areas especially comments on vehicle mass.

The BIC and its members remain strongly committed to working collaboratively with government jurisdictions on any further work to support net zero targets, harmonisation efforts, and drive continuous improvement and safety for the bus industry.

BIC and its members each with their own deep expertise are in a prime position to assist with further refinement.

Additional commentary

Although not part of the original scope, submission responses highlighted three additional areas warranting consideration at a high-level standards framework:

- Consistency in local content requirements particularly supporting local jobs and help efficiency of supply chains,
- How Fuel Cell Electric Vehicles (FCEVs) would be considered, and
- Standardised framework on battery recycling, ensuring sustainable end-of-life management for zero emission bus components.

Addressing these areas would further support industry-wide harmonisation and contribute to more efficient and sustainable outcomes.

Survey

As part of this consultation process, the Bus Industry Confederation (BIC) facilitated anonymous member feedback on each of the 19 proposed requirements outlined in the survey specification document issued by the National Zero Emission Bus (ZEB) Harmonisation Working Group. This approach was designed to encourage candid and constructive input. The consultation was actively promoted via direct email communications and social media platforms.

The response from industry stakeholders was highly encouraging, with over 30 submissions received. These respondents collectively represent more than 75% of the bus industry, encompassing both operators and suppliers across Australia and internationally. The feedback was thoroughly reviewed, acknowledging the strengths of each proposed item while also identifying areas where further work was required. Where applicable, respondents offered practical recommendations or solutions to address these areas.

The summary of the survey is provided below.

Consultation findings

1. Interoperable Charging Ports:

Stakeholders broadly support the inclusion of interoperable charging ports, particularly the use of CCS2 plugs on both rear sides of the bus to enhance depot layout flexibility and public charging access. There is strong advocacy for standardising port location and height, and for including pantograph charging options to future-proof infrastructure. Concerns were raised about simultaneous charging from multiple ports and the need for clear communication protocols to ensure compatibility across systems. The feedback highlights the importance of aligning port configurations with depot-specific charging solutions and ensuring national standards for DC charging.

Recommendation: Generally supported, but with underlying work to refine location limits, specifications and ensure interoperability across jurisdictions.

2. Vehicle Design Life:

Feedback on vehicle design life reveals mixed views. While some support a 21-year minimum, many argue that battery life and technological obsolescence make this target unrealistic. A mid-life battery replacement is widely expected, and some suggest a more practical design life of 18 years. Concerns include spare parts availability, evolving EV technology, technology obsolescence, and the economic viability of maintaining older vehicles. There is also a call for telematics and system interfaces to be supported throughout the vehicle's life to avoid data system obsolescence.

Recommendation: Recommendation to adopt a minimum life of 18 years. 25.9 years is considered too long. Further work is recommended to align vehicle design life with battery lifecycle and operational matters such as spare parts.

3. Isolation Switches:

There is strong support for including vehicle isolation switches, with emphasis on safety and accessibility. Stakeholders recommend external signage and standardised locations for emergency use. The importance of uniform standard was noted, with a strong preference for United Nation standards² like UN ECE R100 (Rechargeable Energy Storage Systems - Batteries) and UN ECE R107 (Omnibus construction). No need to create bespoke isolated standards requiring complex re-engineering, especially with such complex systems at play.

Recommendation: General support for a standard aligning to existing European standards such as R100 and R107.

4. Braking Systems:

Stakeholders generally support regenerative braking systems with ABS override, but there are concerns about brake light activation thresholds and descent testing standards. Some stress the need for compliance with Australian Design Rules (ADR) standards or European standards such as UN ECE R13 (Braking systems). The Transport for NSW (TfNSW) standard TS00090 descent test is seen as stringent, and something largely covered by UN ECE R13 already, so there is a recommendation to avoid regulatory duplication.

Recommendation: Strong support for vehicle to comply with UN ECE R13 requirements which cover automatic brake light activation on deceleration and regenerative braking requirements in preference to proposed standards.

5. Battery Warranty:

Feedback generally supports a standard warranty, but requiring further measuring metrics based on battery state of health (SOH), battery cycles, maximum kilometres and/or usable energy.

² United Nation standards (UN ECE) and sometimes referred to as European standards.

Eight years on its own as a warranty requirement is too high-level will just increase the cost to the State as Suppliers will add a risk premium. Another approach would be to have it as a goal and allow Operators to manage their fleet to extend battery life where they can.

Stakeholders highlight the variability of range due to many factors, among them route, climate, and load. There is a preference for warranties based on usable energy (kWh) and cycle count. Some suggest including telematics access to battery data for lifecycle planning.

Recommendation: Support a standard warranty framework that combines time-based coverage with measurable performance metrics such as battery State of Health (SOH), cycle count, and usable energy (kWh). This approach reflects real-world operating conditions and avoids inflated costs from risk premiums. Consider setting long-term warranty goals (e.g., 8 years) while allowing operators flexibility to manage battery life. Telematics access to battery data is also recommended to support lifecycle planning and warranty validation.

6. Bus Fire Standards:

Stakeholders view ADRI09/01 as a solid foundation for fire risk detection. This is supported by a recommendation for the inclusion of fire suppression systems and for protocols on detection. Both supported by AS5062.

Fire barriers between battery and passenger areas are considered essential, but aligned to existing road vehicle standards. There is no requirement to create bespoke standards when established internationally recognised standards already exist. This can also inadvertently drive-up cost for no net gain.

Strong support for Emergency response information which should be standardised and easily accessible, such as through ANCAP or QR codes.

Recommendation: General support for ADR 109/01 and ANCAP rescue App. Recommendations to follow existing road vehicle standards for fire barriers. Consider a QR code affixed to the vehicles as an additional measure for emergency services information.

7. HVAC (Heating, Ventilation, and Air Conditioning):

The temperature range was generally supported, however there were concerns were raised about the ambiguity of this is to be achieved and the need for regional adjustments, particularly in hotter climates like Queensland.

Several respondents highlighted the importance of clearly defined metrics for testing HVAC pull-down performance. While the high-level requirement is acknowledged, a standardised test method must be established, with driver comfort considered a critical factor. Detailed suggestions on this are included in the full submission.

Recommendation: Temperature range is generally supported noting comments though on QLD or tropical conditions. However further work is strongly recommended by engaging with industry to define pull-down test protocols also, and ensuring driver comfort is addressed.

8. Approach and Departure Angles:

There is general agreement on the need for minimum approach and departure angles, with 7 degrees seen as acceptable by some, though others suggest 8 degrees is more appropriate for varied terrain. The inclusion of underframe skids on all four corners is widely supported, especially for articulated buses.

Recommendation: The proposal is generally supported, with minor regional considerations to be addressed.

9. Entry Floor Height:

Stakeholders support low-floor designs and kneeling functions to improve accessibility. The Australian Design Rules (ADR) limit is already 410mm and by default a mandatory maximum base anyway. This is redundant unless it's lower than 410mm. Two respondents commented on a lower standard height for better general accessibility.

The feasibility of achieving a 100mm kneeling height reduction is questioned due to suspension and wheel arch limitations (physical design constraints). Suggestions from some respondents for kneeling to be 70-80mm below the standard height rather than a prescribed dimension were raised. There is also a call for alignment with accessibility standards and consistency across jurisdictions.

Recommendation: Maximum height generally supported. Recommendation to engage with industry on adjustment of the kneeling height to more physically achievable limits.

10. Minimum Range:

Range

The proposed 300km minimum range has drawn significant comment due to the wide variability in real-world conditions with factors such as terrain, temperature, speed, and passenger load. Many argue that range should be tied to battery state of health (SOH) rather than a fixed distance, and that SORT 1 (standard on road test cycles) testing is too narrow to reflect operational diversity.

The actual range of 300kms throughout life has drawn comments from operators and OEMs as being too high, or requiring re-phrasing to 300km based on minimum SOH. This may drive up vehicle cost due to addition of additional batteries and reduce capacity due to additional weight.

300km is too specific when vehicles speed, load, the ambient temperature, the terrain and wind all have an effect on the power used. A recommended metric would be *useable power/energy*. All potential routes would have a power use average and with experience Operators would be able to estimate a maximum plus buffer on each route.

Sort cycles

There is strong support for using SORT 2 test cycles and for allowing flexibility based on route-specific needs. Stakeholders also recommend using usable energy (kWh) as a more reliable metric.

It was also noted that SORT cycles only measure drivetrain and not ancillaries such as HVAC, so this needs to be taken into account. SORT cycles will not reflect range abilities given ancillaries are excluded, hence the commentary on SOH and usable power.

Recommendation: Further work is needed with industry to develop a range definition that defines additional metrics, such as battery state of health (SOH) and especially usable power (kWh) and real-world requirements.

The inclusion of ancillary loads like HVAC should be adopted to ensure more accurate and operationally relevant range assessments.

11. Interior Fit-Out:

Feedback supports a consistent national approach to interior layouts, particularly for accessibility features like wheelchair bays and ramps. Manual ramps are preferred for their reliability and ease of maintenance. Stakeholders recommend standardising mounting points and cabling for systems like CCTV and passenger information displays to reduce retrofit costs. However, more detail is needed on the proposed layout and how it aligns with DDA requirements.

Recommendation: National consistent layout is supported, however further information on the QLD layout to stakeholders not familiar with it is required to provide further feedback.

12. Passenger Doors:

There is very strong support for a harmonised national standard. There is a divide between support for the NSW TS160 standard and preference for the internationally recognised UN ECE R107 standard. Stakeholders highlighted current reliability issues with TS160, particularly in operating on inclines. These issues are related to the requirements of the standard itself. UN ECE R107 is seen as equally comprehensive, covering emergency operation, force limits, and communication protocols.

Recommendation: Strong support for a single national standard.

This is either taking advantage of UN ECE R107 with its international consistency and existing reliability or, if TS160 is adopted as the national standard then reliability issues related to the standard need to be addressed prior at a regulatory level. Further work is needed.

13. Energy Use Reporting:

Stakeholders generally support standardised energy use reporting for the powertrain using UITP SORT and E-SORT cycles, noting it excludes ancillaries such as HVAC. Clarification is needed on which SORT cycle applies (with a preference for SORT2).

Whilst HVAC testing is listed in Transport for NSW standard TS 00091, also consider alternate international standards such as Regulation (EU) 2022/1379 – range measurement. The tests required to attain these requirements are very costly to conduct so allowing for alternate

equivalent or internationally recognised standards to identify range is important. There is a call for including HVAC metrics and for exporting data in machine-readable formats for integration with fleet management systems. Government should also consider factors such as energy loss between grid supply and actual bus consumption.

Recommendation: The proposal is generally supported, with consideration that alternate equivalent standards to be permitted. Minor refinements to ensure clarity inclusion of HVAC and consistency in data reporting and factoring energy loss.

14. Electrical Standards:

There is broad support for aligning with vehicles with a standard such as UN ECE R107, though stakeholders request clarification on which sections shall apply to provide clearer metrics. Some suggest including AS/NZS 3000 for infrastructure compatibility (not the vehicle).

Recommendation: Generally supported with further work is required to clarify applicable sections of the standard shall apply.

15. High Voltage Safety:

Stakeholders support compliance with UN R100 Rev 3 (which is the same as ADR 109/01). There is also support for integrating the vehicles 'safety status' into fleet monitoring systems to aid incident response.

Whilst not directly in the original scope, there was also comments on standardising technician safety protocols, particularly the ability to verify zero voltage before maintenance and the need to adhere to AS 5732-2022. Standardised access for volt checks and clearer definitions of "high voltage" are needed.

Recommendation: Generally supported standard of UN ECE R100.3 (ADR 109/01).

16. Advanced Driver Assistance Systems (ADAS):

Respondents support including certain ADAS features, especially such as blind spot monitoring (BSIS), lane departure warnings (LDW), and vulnerable road user alerts. Stakeholders argue that these systems are now standard in many vehicles and should be included in ZEBs to enhance safety. Some states already require ADAS in diesel fleets, and there is concern that excluding it from ZEBs is a step backward. BSIS provides driver and vulnerable road user safety benefits. Studies have indicated, BSIS can reduce collisions by 40%, thus making it safer for pedestrians, cyclists or other shared road users.

Recommendation: Further work is needed to define and mandate a baseline ADAS package for safety and consistency, with BSIS being included as a minimum requirement.

17. Passenger Counting:

Generally agreed not to include as a baseline standard. Some general comments though on standard interfaces for data collection and compatibility with other systems are encouraged.

Stakeholders support making the feature optional but recommend that vehicle architecture should not preclude future integration.

Recommendation: Generally supported.

18. No Child Left on Board:

This feature is widely supported for school buses, with the WA system cited as a successful model. It is not yet considered necessary for city buses, but stakeholders recommend adopting best practices and ensuring national consistency. Integration with seatbelt warning systems and other safety features were also encouraged by some respondents.

Note the United Nations are presently working to create a UN ECE standard for this, which BIC are on the working group.

Recommendation: The proposal is School buses through should include it as best practice. Any standard should align with UN ECE regulation once finalised.

19. Vehicle Weight/Mass:

There is support for maximised passenger capacity however a minimum baseline is encouraged to help steer minimum requirements. Battery weight is a major concern, as it inhibits passenger capacity under current 18t limits. Stakeholders support increasing the GVM to 19t or even as high as 20t to better match two-axle buses to match diesel capacity equivalents.

Mass increase is especially important for school buses with luggage bins whereby Australian Design Rules mandate additional 15kgs of luggage per passenger is factored in when calculating passenger capacity (an extra 15kgs per passenger). This equates to an extra 855kgs for a typical school bus. Current mass limits will most likely see a drop in capacity in this segment unless change is adopted.

There is also a call for standardising passenger mass assumptions (e.g., 65kg vs other standards both local and overseas). National consistency in weight calculations is essential to avoid confusion and ensure fair capacity assessments.

Additional Comments: The BIC has consistently advocated for increased vehicle weight allowances, noting the pushback posed by jurisdictional road maintenance authorities.

To achieve emissions reduction targets, optimise passenger capacity, and deliver commercial benefits to both governments and BIC members, the BIC urges the National ZEB Harmonisation Working Group to actively support weight increases. (refer to our paper [Dimensions and Mass – Low emission buses/Coaches 2023](#) for detail.

Recommendation: Further work is required to harmonise weight standards and preserve operational efficiency. Recommended that the *National ZEB Harmonisation Working Group* advocates for higher mass limits to support long standing industry calls.

Further Consultation

Should the *National ZEB Harmonisation Working Group* wish, the BIC would be open to discuss this document and commentary in further detail.

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