BIC
BUS INDUSTRY CONFEDERATION
moving people

Bus Industry Policy Position Paper

Driving Towards Zero-Emissions

June 2024

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Executive summary

Buses can lead the transition

- The Australian bus industry is uniquely positioned to lead the transition to zero-emission technologies for heavy vehicles.
- As an industry, we can significantly reduce transport emissions, while helping Australia meet its climate targets and creating new economic opportunities.
- But the transition must be carefully managed to ensure the best outcomes while protecting our economy, including jobs and essential services.

Key challenges

- Key challenges to transitioning the bus industry to zero-emissions include:
  - Inadequate electricity grid capacity.
  - High upfront costs for depot upgrades and infrastructure. The capital cost of buses is also higher but insignificant compared to other capital expenditure to support the transition.
  - Fragmented state and territory policies, including worker training and local content policy.
  - A lack of social license for the transition.
- Mandating aggressive timelines and specific technologies will lead to higher cost and potential failure.
  - Australia should ensure a gradual and effective transition to meet our ambitious environmental targets.

Recommendations

- Federal, State and Territory governments should partner through National Cabinet to build a harmonised national framework based on seven pillars:

1. Generate more renewable energy.
2. Build the infrastructure needed to charge and fuel zero-emissions heavy vehicles.
3. Support the zero-emissions heavy vehicle supply chain and manufacturing.
4. Provide targeted financial support for the heavy vehicle industry.
5. Ensure nationally recognised and harmonised workforce training and credentials.
6. Introduce nationally harmonised local content policy that is fair to both manufacturers and importers.
7. Foster social license for the transition in the Australian community.

- The Australian Government should fund a new Office of National Heavy Vehicle Industry Coordination to facilitate the development and implementation of a National Heavy Vehicle Transition Plan.
  - Include a national heavy vehicle manufacturing plan and long-term procurement roadmap which clearly identifies the timing and scale of procurement by state and territory governments.
- The Australian Government could tie future federal grants that are negotiated with the states and territories to commitments that those jurisdictions will implement this unified national framework.
- Australia should utilise all technologies that can lower carbon emissions to help Australia meet its emissions targets.
  - We should start by prioritising the replacement of all vehicles that are below Euro 5, rather than mandating a blanket rollout of zero-emissions buses.

Introduction

The bus industry is uniquely positioned to lead the transition to zero-emission technologies within the heavy vehicle sector. The bus industry is an early adopter of technologies and the ideal industry for demonstrating the viability of battery electric and hydrogen fuel cell electric (together 'electric') buses, low carbon liquid fuels (LCLFs), Euro 7 and later diesel, and hybrid diesel.

The bus industry's highly scheduled nature makes it an excellent testing ground for the capabilities and cost-effectiveness of a range of low- and zero-emissions technologies. We can provide a roadmap to decarbonisation for other heavy vehicles fleets.

A low carbon heavy vehicle industry is possible in Australia over the next 25 years and is one of the simplest ways to reduce national emissions. However, the BIC is concerned that unless there is meaningful progress in reducing existing roadblocks, Australia will not meet its emissions reduction targets. Some state mandates on zero-emission buses have already been amended, and others will need to follow.

We emphasise the need to avoid mandated timelines for adopting zero-emissions technologies. Aggressive and inflexible timelines put optimum options at risk because we do not yet fully understand the advantages, disadvantages, and supply chain issues with each technology.

All potential technologies must be part of our low- and zero-emissions energy mix. The real cost, advantages and challenges of each technology can only be assessed by whole-of-life projects that incorporate all the required infrastructure. While early zero-emissions projects will be expensive, there is no other way to build industry capability and demonstrate how to create scale that reduces cost. A diverse mix of technologies can ensure that we do not disrupt the economy while we reduce emissions. If we rely exclusively on electric technologies, we lack a 'pressure valve' to effectively manage demand in the event that we fail to secure enough green power and infrastructure.

Government funding will be essential since these technologies are costly. We must also identify and deliver the right support for the supply chain and manufacturing of this mix of low and zero-emissions technologies. The BIC's Zero Emissions Bus committee is working to estimate the necessary vehicle supply to meet Australia's emission targets, but the optimal mix of technologies will ultimately be driven by factors such as cost, availability of power, and specific operational contexts.

Governments must also expend political capital to increase green power generation. This will take political courage, leadership, and the ability to bring communities along – to help Australians embrace solar and wind infrastructure. Without popular support, Australia will risk its 2050 net zero commitment.

Exploring all available technologies is the best way to maintain our economic capabilities and grid supply while meeting our emissions targets and setting a benchmark for the broader heavy vehicle sector, which can dramatically reduce emissions over the next 25 years and assist Australia to meet its obligations. This transition is already starting with buses and should be accelerated.

Australia's energy transition

Australia is undergoing a massive energy transition, committing to reduce greenhouse gas emissions by 43% from 2005 levels by 2030 and achieve net zero by 2050. To transition our economy to cleaner energy – across all industries – we will need to navigate a number of major challenges, as outlined in Figure 1.

Figure 1: Major Challenges for Australia

Supply	Reliable Infrastructure	Supply Chain and Manufacturing
• Rapid growth in renewable energy, batteries, and new generation technologies means that the electricity system in Australia will look dramatically different in the years ahead. • Australia must produce enough green energy to transition all sectors of the economy without compromising grid reliability or dramatically increasing energy prices.	• Australia needs to efficiently 'pipe' our green energy to where it is needed, including to bus depots. • This requires smart investment in transmission and distribution infrastructure, to power low- and zero-emissions vehicles, buildings, and factories.	• Key industries need support along the supply chain and for manufacturing to ensure the availability of a range of low- and zero-emissions technologies. • Lead times are currently long, and costs too high, for the production, delivery and installation of zero-emissions vehicles and infrastructure.

Nationally Harmonised Policy	Workforce Development and Upskilling	Community Engagement
• Unified policy frameworks across federal, state & territory governments will ensure the energy transition can be efficient, safe, and technically successful. • For example, Australia needs a national local content policy that respects all aspects of the supply chain to allow for a unified playing field for both local manufacturers and importers.	• Training and education institutions and industry must partner to upskill our workforce in both zero-emissions vehicles and infrastructure, in order to meet the demands of our greener future. • We must make the right investments in vocational training programs and apprenticeships.	• Proactive community engagement is required to build 'social license' for the energy transition. • We need the buy-in of all Australians, particularly those from local communities who would be home to clean energy projects.

The BIC has sought, in developing this Industry Policy Position Paper, to align with the direction of the range of national strategies and targets that Australia has adopted:

Strategies	Targets
Net Zero Plan[1]	The Net Zero Plan will guide the transition to the target of net zero greenhouse gas emissions by 2050.
Transport and Infrastructure Net Zero Roadmap and Action Plan[2]	The Transport and Infrastructure Net Zero Roadmap and Action Plan, aims to: 1. Reduce emissions in the transport and infrastructure sectors. 2. Support national and international commitments to reduce greenhouse gas emissions. 3. Maximise economic and productivity opportunities. 4. Provide investors with future investment certainty. 5. Deliver a nationally consolidated approach to accelerate decarbonisation for key sectors.
National Electric Vehicle Strategy[3]	The National Electric Vehicle Strategy is part of the Australian Government's Powering Australia Plan to improve affordability, create jobs, and reduce emissions. It offers a consistent framework to transition Australia's road transport sector to net zero emissions.

[1] Department of Climate Change, Energy, the Environment and Water. (n.d). Net Zero
[2] Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (n.d). Towards net zero for transport and infrastructure
[3] Australian Government. (n.d). National Electric Vehicle Strategy

Strategies	Targets
Australian New Vehicle Efficiency Standard[4]	From January 1, 2025, all vehicle importers in Australia must achieve a fleetwide average emissions intensity of 141 gCO2/km for passenger vehicles and 210 gCO2/km for light commercial vehicles.
A Future Made in Australia[5]	The Australian Government has announced the Future Made in Australia program, a $22.7 billion investment over the next decade to attract private investment into five priority industries: 1. Renewable hydrogen 2. Critical minerals processing 3. Green metals 4. Low carbon liquid fuels 5. Clean energy manufacturing, including battery and solar panel supply chains
Infrastructure Policy Statement[6]	The Australian Government's Infrastructure Policy Statement sets out three strategic themes that guide infrastructure investment decisions: 1. Productivity and resilience 2. Liveability 3. Sustainability
National Hydrogen Strategy[7]	Australia's National Hydrogen Strategy sets a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians. It aims to position our hydrogen industry as a major global industry by 2030.
National Energy Performance Strategy[8]	The National Energy Performance Strategy will coordinate efforts to improve energy performance for all Australians, including: 1. Energy efficiency: using less energy to achieve the same results. 2. Demand flexibility: varying when and how energy is used. 3. Electrification or fuel switching – adopting electricity-powered technologies or other cleaner energy sources. The Australian Government is investing $15.2 million until 2026 to develop, evolve and deliver the Strategy.

[4] AEVA. (May 18, 2024). Australia legislates a New Vehicle Efficiency Standard!
[5] Budget 2024-25. (n.d). Future Made in Australia
[6] Australian Government. (n.d). Infrastructure Policy Statement
[7] Department of Climate Change, Energy, the Environment and Water. (n.d). Australia's National Hydrogen Strategy
[8] Department of Climate Change, Energy, the Environment and Water. (n.d). National Energy Performance Strategy

Strategies	Targets
National Energy Transformation Partnership[9]	The National Energy Transformation Partnership is a framework for the Australian Government and state and territory governments to collaborate on reforms to help transform Australia's energy system to achieve net zero by 2050.
National Partnership Agreement on Land Transport Infrastructure Projects[10]	The National Partnership Agreement on Land Transport Infrastructure Projects is an agreement between the Commonwealth and the States and Territories. The agreement facilitates investment in land transport infrastructure to deliver a national transport system that is safer and more secure for users, drives national productivity and economic growth, accommodates Australia's growing population and supports competitive markets and employment opportunities.
National Energy Productivity Plan[11]	Australian Government set a National Energy Productivity Target to improve Australia's energy productivity by 40% between 2015 and 2030.
National Battery Strategy[12]	Australia's first-ever National Battery Strategy aims to make the country a globally competitive producer of batteries and battery materials by 2035.
Renewable Energy Superpower[13]	The Australian Government has committed to a national renewable electricity target of 82% by 2030.
Rewiring the Nation[14]	Rewiring the Nation is investing $20 billion to modernise the electricity grid and upgrade transmission infrastructure. The program offers concessional financing to minimise investment costs and lower infrastructure costs for consumers.
Paris Agreement[15]	The Paris Agreement has the overarching goal of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. However, in recent years, world leaders have stressed the need to limit global warming to 1.5°C by the end of this century.

[9] Dept of Climate Change, Energy, Environment and Water. (n.d). Australia's Energy Strategies and Frameworks
[10] National Partnership Agreement on Land Transport Infrastructure Projects. (n.d)
[11] Department of Climate Change, Energy, the Environment and Water. (n.d). National Energy Productivity Plan
[12] Andy Colthorpe, 2024, National Battery Strategy: Australia targets 'globally competitive producer' status by 2035
[13] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Speech on Australia as a Renewable Energy Superpower, Australian Embassy, Japan, 26 July 2023
[14] Department of Climate Change, Energy, the Environment and Water. (n.d). Rewiring the Nation
[15] Paris Agreement, United Nations, 2015

Buses can help drive the energy transition

Australia's bus and coach industry is uniquely placed to help lead the transition of heavy vehicles to low- and zero-emissions energy sources. Public transport buses and school buses run predictable routes and routinely return to a central depot, which simplifies the infrastructure requirements for refuelling or recharging.

Buses do not mass load and cover fewer kilometres per year compared to trucks in Australia. The bus industry's lower overall electricity demands to decarbonise make it a more manageable sector for testing and proving new energy solutions.

Chart 1: Annual distance travelled (in billions of kilometres)

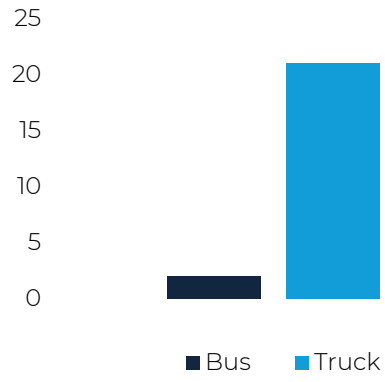
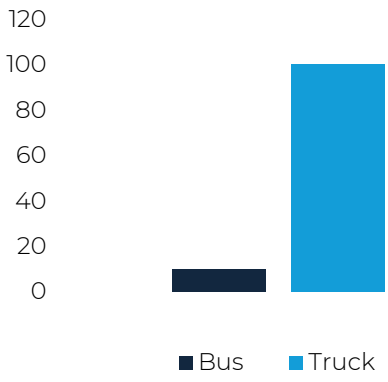


Chart 2: Annual electricity demand (in TWhs) if heavy vehicle fleet was electrified



The bus industry's successful transition could provide a blueprint and inspire confidence in decarbonising heavier forms of transport such as the truck industry, which is currently looking to the bus industry for advice. Buses also generally run under state government contracts, have back-to-base operations and operate on set routes which means that the bus industry offers a clear pathway to demonstrate the transition.

The transition must be carefully sequenced in order to be technically successful and avoid impacting the critical services that Australians rely upon buses to provide. The Australian bus industry has been working on the energy transition for **15 years** and can serve as a thought partner for Australian governments as they map out the policy framework that will guide the transition.

As Australia's national peak body for the bus and coach industry, the Bus Industry Confederation (BIC) represents operators, manufacturers, suppliers, and service providers on policy issues of national importance. We are instrumental in shaping policies and regulations that impact the industry's operations and growth. The BIC is working to support the development of policies that will facilitate a smooth transition to low- and zero-emission technologies.[16]

Nearly **1,500 buses** in Australia are already low- or zero-emissions.

[16] Bus Industry Confederation. (September 2023). When Green isn't Green.

In response to the urgent need for climate action, several state programs have been introduced to decarbonise transportation. Projects that demonstrate whole-of-life costs in each technology are required to show how – and with what technologies – we should decarbonise our industry. Initially, these projects will require government funding, but seeing projects through their whole life is the only way we can understand the costs, advantages, and challenges of each technology.

The Australia Institute concluded that well-serviced electric bus routes can promote greater use of public transportation, offering affordable and accessible transit, and reducing household transportation costs.[17]

Infrastructure Australia estimates that Australia can avoid **$38.8 billion** annually in congestion costs by shifting from private vehicles to a well-managed public transport network.

Critically, the Australian bus industry must be able to see at least a **10-year pipeline** of procurement demand from state and territory governments in order to justify making the investments needed to reach our zero-emissions future. Our bus manufacturing sector and supply chain will also require increased government support to successfully deliver the necessary zero-emission buses and associated infrastructure. Other countries are already mapping out their procurement pipelines:

Germany

Transport companies in Germany have clear line of sight to procurement plans requiring around **6,600** more electric buses by 2030. This would put a total of nearly **8,500** electric buses on German roads by the end of the decade.

The central pillar of a successful energy transition, however, will be to create sustainable markets. Dr Alan Finkel's observation relating to hydrogen technologies has broad application to all low- and zero-emissions technologies[18]:

'Governments have provided substantial financial support to nurture their early hydrogen industries. While this support is invaluable, ultimately the global hydrogen industry will only flourish if there are sustainable markets. Sustainable markets are built on scalable technology, cost effectiveness and above all, trust.'

– Dr Alan Finkel
Special Adviser to the Australian Government on Low Emissions Technology

The BIC is pleased to share our learnings to help inform the creation of sustainable markets for all low- and zero-emissions bus technologies – built on mutual trust.

[17] Audrey Quicke, Sienna Parrott. (May 2022). The Australia Institute. Next stop - Zero-emission buses by 2030
[18] Dr Alan Finkel, Keynote Address to APEC Low-Carbon Hydrogen International Standard Workshop, 2022

Challenges in transitioning buses

An aggressive transition to zero-emission technologies will disrupt the diesel bus supply chain that has existed for the last **100 years** and require a complete upheaval of vehicle production and operation. Several state governments have announced bus electrification targets for 2030 that are not feasible due to supply chain issues, the availability of power and infrastructure.

Early experience from initial transition projects has identified several challenges in converting traditional bus fleets to zero-emission buses[19]:

1. **Inadequate Electricity Grid Capacity:** Converting Australia's entire bus and truck fleet to zero-emissions would use the equivalent of **100%** of current renewable generation. Australia will need costly grid upgrades and coordinated action from electricity network suppliers. Transport authorities must work closely with operators and infrastructure providers to forecast both depot and power requirements, so that infrastructure providers can include these needs in their planning. In the first instance, we should prioritise energy to bus depots that can be electrified at the lowest cost. Rushing the energy transition will put pressure on the grid. We must recognise that technologies other than electric can provide acceptable outcomes.
2. **Depot Upgrades:** New or upgraded bus depots are subject to land availability and lengthy construction periods, requiring significant site planning and carefully calibrated design and performance specifications. Zero-emissions bus depots will require more space and costly infrastructure upgrades, as well as maintenance facilities for electric buses.
3. **Tax Implications of Federal Funding:** Projects funded by the Australian Renewable Energy Agency (ARENA) are subject to tax on their funding, which discourages potential transition projects. This is particularly true for fuel cell electric vehicle (FCEV) projects with high infrastructure costs; there are hardly any FCEV projects ready for approval that can provide the whole-of-life data we need to assess cost and effectiveness. Permitting accelerated depreciation of assets funded by ARENA would help to overcome this challenge.
4. **Contractual Structure:** State government contracts fund most bus operations in Australia. Data on moving to zero-emissions buses (especially FCEVs) shows that the current contractual requirements of state governments are not fit for purpose. The sheer scale of ancillary infrastructure costs, plus the variability and complexity of power costs, indicate that a new approach is necessary. The BIC recognises the challenge this poses for states, but when state governments seek to limit their own risk, industry operators are put in an untenable position, and this hinders projects that could otherwise inform our transition (especially FCEV projects).
5. **Battery Recycling:** The demand for batteries for transport will grow significantly, increasing the need for future recycling or recovery. This issue cannot be overlooked, and any roadmap should incorporate technical assessments of potential solutions.
6. **Worker Upskilling:** Australia's existing vehicle workforce still requires extensive training, development, and experience with zero-emissions vehicles – on everything from operation to maintenance. There are acute skills shortages across the automotive industry in all states and territories, and the problem is worse in regional areas. Automotive repair and maintenance are amongst the occupations that are hardest to

[19] L.E.K., Arup. (February 2021). UITP International Association of Public Transport Australia New Zealand. 2020 Zero-Emissions Bus Forum.

fill.[20] There is also a national shortage of qualified workers to carry out infrastructure upgrades. The Electrical Trades Union has reported that there will be a shortfall of 32,000 qualified electricians by 2030, with another 85,000 electricians needed by 2050.[21] Training must be nationally consistent.

7. **Fragmented Policy Design:** Training, procurement, and other policies remain disjointed across Australia's states and territories. These must be harmonised to allow the bus industry to efficiently scale low- and zero-emissions technologies without the need to navigate eight different state and territory regulatory regimes.

8. **Lack of Social License:** Despite world-leading safety practices, bus industry workers and passengers are sometimes still concerned about safety. Communities are concerned about solar panels, wind turbines and energy transmission infrastructure. Government and industry must partner to build the social license required to deploy zero-emissions technologies at scale for buses. This means gaining support from the community, which takes political leadership and national education.

   High upfront costs of zero-emission buses: Battery electric buses currently cost around $840,000 while a fuel cell electric bus costs around $1.4 million. By comparison, a diesel bus costs around $735,000. Electric buses manufactured in Australia are currently more expensive than those fully imported from low-cost countries. To ensure the lowest cost for Australian-built electric buses, state and territory government procurement policies need to change. Australian manufacturers require greater certainty about government demand in order to justify the investments in production capabilities that are needed. A clear line of sight over the future procurement pipeline will enable local manufacturers to unlock new efficiencies in the supply chain and manufacturing.

   Higher costs should not be allowed to drive buyers overseas, where cheaper labour enables the production of lower cost buses at the expense of Australian jobs, know-how and ultimately our manufacturing sovereignty. We must create local jobs through national local content requirements, similar to the U.S. 'Build America, Buy America' program[22], perhaps as part of the Australian Government's Future Made in Australia Act. The BIC appreciates the Prime Minister's commitment to 'look at every measure that will make a positive difference', including 'financing facilities and investor incentives to drive new economic growth'[23]. We believe that far-sighted investments in energy transition for the bus industry – and local jobs – meet that definition.

Our international peers are already making these vital investments:

United States

The Clean School Bus Rebate program allocates **A$7.6 billion** for school districts to convert buses to electric power. The U.S. Department of Transportation also awarded **A$2.6 billion** in grants to facilitate the purchase of zero- and low-emission buses across 46 states and territories.

[20] Deloitte Access Economics (2024) Skills shortages in the Australian automotive industry
[21] Rewiring the Nation? Not without apprentices, sparkies warn, Energy Source & Distribution, 4 October 2023.
[22] What Is Build America, Buy America? Office of Management and Budget, Made in America Office.
[23] 'A future made in Australia', Speech by Prime Minister Anthony Albanese, Queensland Media Club, Brisbane, 11 April 2024.

United Kingdom

The UK Government announced a **A$275 million** investment to introduce nearly **1,000** new zero-emission buses across England, prioritising rural areas. An estimated **4,200** zero-emissions buses will be funded across the UK between 2020 and 2025.

Zero-Emission Bus Regional Areas (ZEBRAs)

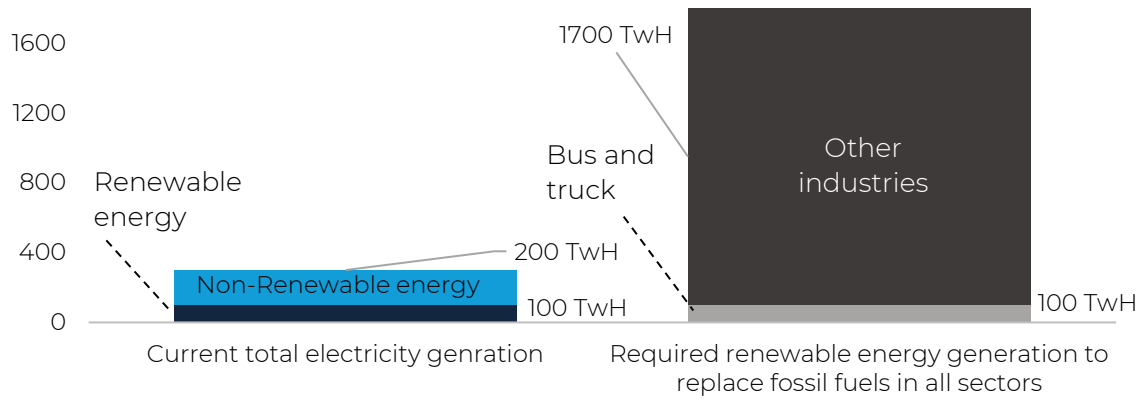
- The UK introduced 'Bus Back Better' in 2021 as its national bus strategy. The ZEBRA 1 program allocated funding for **1,300** zero-emission buses, supporting everything from technological development to rollout. Now, the ZEBRA 2 program will provide **A$248 million** to further support the introduction of zero-emission buses.[24] The ZEBRA grant covers up to **75%** of the cost increase between a diesel and zero emissions vehicle (together with necessary infrastructure).
- In Latin America, ZEBRA is a partnership led by the C40 Cities Climate Leadership Group and the International Council on Clean Transportation. A coalition of international investors committed to invest over **A$1.5 billion** to support the deployment of electric buses across Latin American cities.[25]

Australia must generate sufficient renewable energy

While Australia has made progress in expanding renewable energy sources like solar and wind power, we have much more work to do as a nation. A smooth transition requires a coordinated effort between federal and state governments, the power generation sector, and industrial users of green energy. Bus operators report difficulty in securing long term power agreements with suppliers. This is a new area of expertise, for which industry needs support.

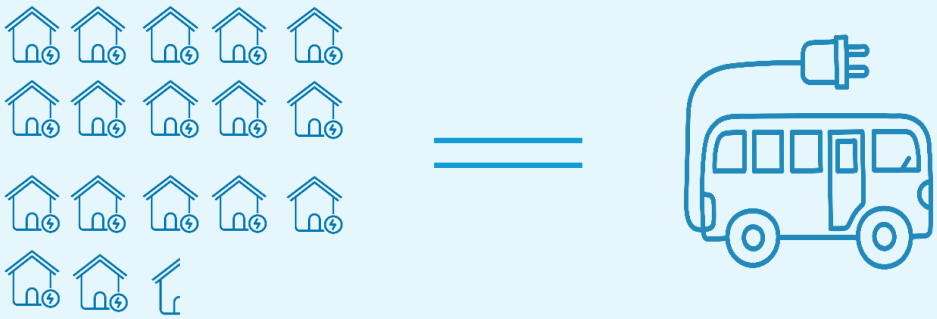
As Chart 3 illustrates, if Australia were to decarbonise using green electricity, it would need to generate many times more green energy than our electricity grid currently produces.[26] This seems unachievable and reinforces the need for alternate, complimentary low-carbon solutions while Australia builds grid capacity.

Chart 3: Renewable energy required to decarbonise entire Australian economy[27]



[24] Department of Transport UK. (November 20, 2023). Apply for zero-emission bus funding (ZEBRA 2).
[25] C40 cities. (November 11, 2021). New $1 Billion dollar commitment from investors to deliver zero-emission buses in Latin America.
[26] Stephen Lucas. (November 16, 2022). Bus Industry Confederation. Why a ZEB is not diesel.
[27] Stephen Lucas. (November 16, 2022). Bus Industry Confederation. Why a ZEB is not diesel.

State governments have already made plans to transition to zero-emissions buses from 2025. As this transition gathers momentum, energy companies will need to produce many more green electrons. Once fully electrified, bus depots and other commercial fleets will become substantial energy consumers. The average bus uses energy equivalent to **17.7** houses worth of energy per day.[28]



The average bus uses energy equivalent to **17.7 houses** per day

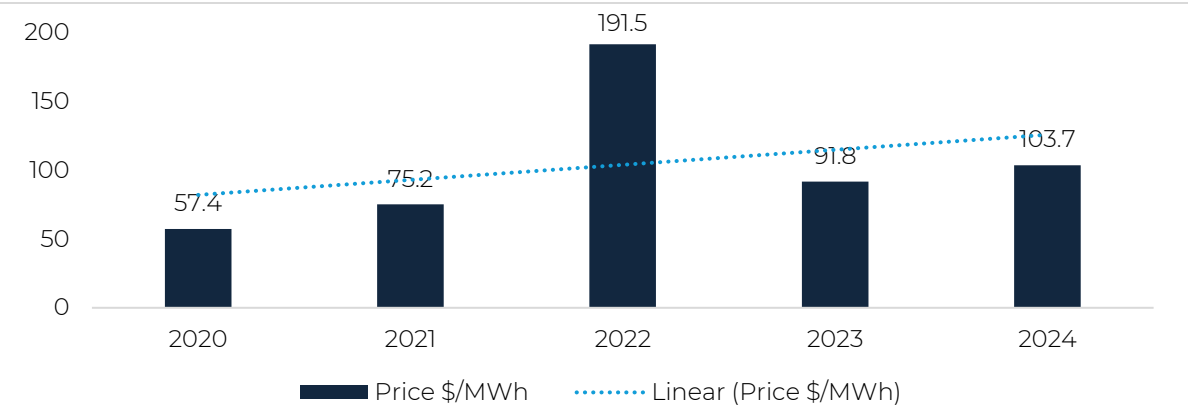
The BIC strongly supports the Australian Government's announced $1 billion investment in solar panel manufacturing but notes that a single battery-electric bus charged using solar panels would require all of the power generated by **320** solar panels – every day.[29]

Overloading the electricity grid will lead to rolling blackouts, which can severely disrupt economic activity and the daily lives of all Australians. Buses and coaches provide essential transport services for millions of Australians, promoting economic and social inclusion through access to employment, education, healthcare, and social opportunities – particularly for Australians on lower incomes. Protecting vulnerable communities from disruption must be a core priority for the energy transition.

Increasing the use of electric buses will increase demand for electricity, meaning higher electricity prices, unless supply is dramatically increased. As seen in Chart 4, electricity prices have already increased by **81%** over the last five years alone, and many Australians cannot afford further increases.

[28] CSIRO. (n.d). Typical House Energy Use.
[29] Department of Climate Change, Energy, the Environment and Water. (n.d). Solar Panels. On average, a single solar panel produces 1kWh of electricity daily. Each electric bus consumes 320kWh of electricity per day.

Chart 4: Electricity prices up 81% in 5 years ($ per megawatt-hour)



To achieve zero emissions for the heavy vehicle industry, all of the energy required to power zero-emissions trucks and buses must come from green power. Including low-carbon liquid fuels (LCLFs), Euro 7 and later diesel, and hybrid technologies in the energy mix will alleviate the demand on power and power infrastructure while still reducing carbon emissions. This strategy will enable Australia to:

- Provide a 'release valve' against grid overloads, mitigating the risk of blackouts.
- Enable low emission buses where electric buses are unviable.
- Reduce the near-term need for manufacturers to produce a high volume of zero-emissions buses.
- Ensure a gradual and effective transition to meet environmental targets.

To build the green energy generation capacity we need, governments and industry must also earn 'social license' from Australian communities who are being asked to make room for more solar panels, wind turbines and transmission lines and towers.

Getting renewable energy from generator to depot

As Australia's bus depots transform to station zero-emissions buses, we will require a nationally coordinated electricity grid upgrade. The federal and state governments must develop a long-term national depot upgrade strategy to identify sites that should be electrified first based on energy availability and grid connection opportunities. Next, a feasibility study can show the potential order and locations requiring urgent action to upgrade the grid, plus associated transmission requirements.

There is some spare capacity for upgrades across certain parts of our electricity grid, but more investment will be required to cover the entire grid. New transmission towers, poles, and wires have long been a contentious issue for regional and metro communities alike. Again, building social license is key.

Government funding and long-term planning are vital to give the bus industry the confidence it needs to invest in transitioning depots and fleets to zero-emissions technologies. Australia needs a comprehensive national plan that includes:

- **Enabling renewable energy to flow to depot charging points:** Australia has 40,000 km of electricity transmission lines and cables, but expanding this distribution capacity is hindered by lengthy planning processes, community opposition, and rising construction costs. The Australian Energy Market Operator (AEMO) published an

Integrated System Plan outlining the lowest-cost pathway for energy generation, storage, and transmission infrastructure to meet consumers' needs for secure, reliable, and affordable energy and achieve net zero-emissions targets. It provides a comprehensive roadmap for the national production of electricity for the next 20 years.[30]

- Government funding for bus depots: Given the substantial cost of upgrading depots, it is essential that governments support industry to make the transition. A strong example is the Transgrid/Zenobe joint venture in Leichhardt to power Australia's largest single fleet of electric buses – installing the infrastructure needed to support 40 electric buses with batteries, stationary storage, depot conversion, and charging. The project appropriately received strong financial support from the Federal Government[31] via ARENA and the Clean Energy Finance Corporation (CEFC).[32]

The BIC Council has established an Energy and Infrastructure Group to work with governments and energy distribution companies to identify the energy supply needed to transition Australia's buses and coaches to zero-emissions. In the meantime, we agree with the Australian Government that low-emissions technologies – such as renewable and low carbon fuels – must continue to play an important role.

Hydrogen fuel-cell buses will require the development of hydrogen refuelling infrastructure. Each refuelling station may cost over $5 million. The bus industry also plans to build and operate hydrogen production and storage infrastructure. These initiatives will require targeted government financial support and assistance in streamlining regulatory approvals.

Australia's approach to rolling out charging and refuelling infrastructure is currently piecemeal, with regulations and investment varying by state and territory. Our country will benefit from a unified national strategy, with significant government investment in charging and refuelling infrastructure.

Support for supply chain and manufacturing

Our zero-emissions bus supply chain is under pressure. Bus operators seeking to run vehicles powered by electricity report lead times of years to upgrade power infrastructure. Operators also report that some providers are unable or unwilling to commit to necessary upgrades at any price. The way infrastructure providers are funded and the length of time they are funded for remain impediments to the transition. If vehicle and infrastructure procurement can be reformed so that our manufacturers can optimise efficiency it will enable us to roll out the volume of zero-emissions vehicles needed.

The Australian Government must provide appropriate support to the supply side of the bus industry so that the supply chain is capable of delivering the required number of zero-emissions buses – and the refuelling and charging infrastructure – that the bus industry needs to transition.

Already, the Victorian state government has had to push out its previously mandated deadline for cessation of new diesel bus sales from the original 1 July 2025 deadline, now allowing delivery out to 2028 provided orders are placed before the original 1 July 2025 deadline. States are struggling to roll out zero or low emission buses because of the cost

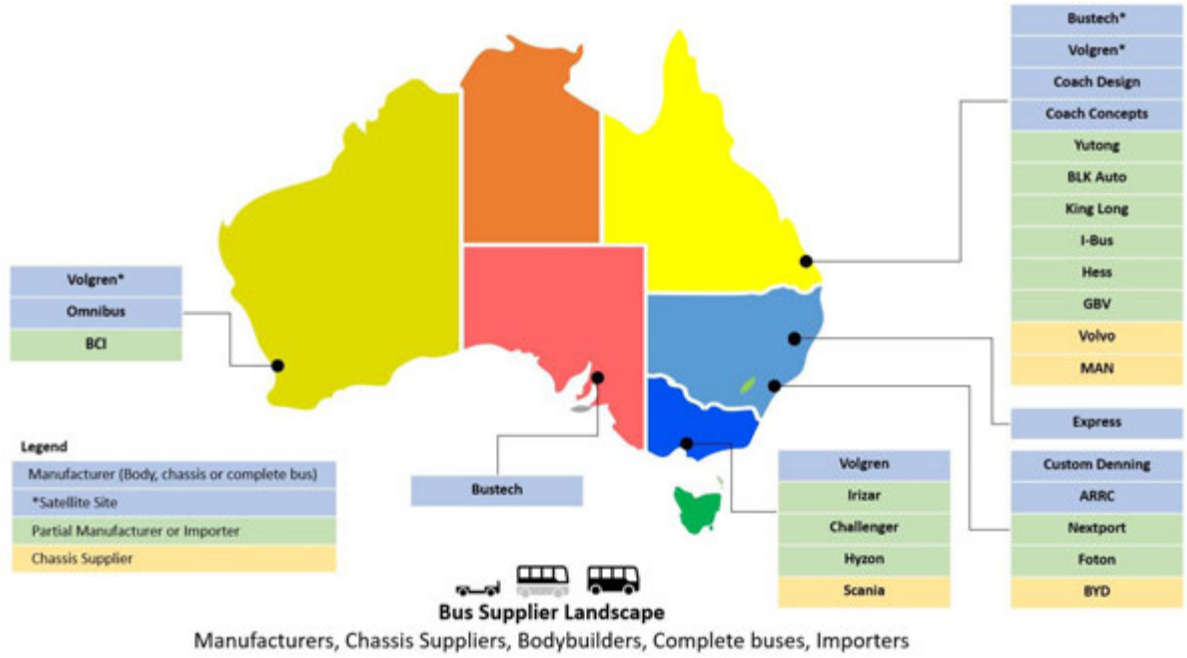
[30] AEMO ISP 2024: A roadmap to net zero. (March 1, 2024). AEMO's Draft 2024 Integrated System Plan
[31] Transgrid. (October 21. 2021). Sydney's Big Step to Clean Energy: Largest Electric Bus Fleet.
[32] Amalyah Hart. (January 10, 2023). Australia's biggest electric bus depot offers solar and battery blueprint for future.

and lead times for infrastructure and an unwillingness to fund solutions other than battery electric vehicles.

Federal policy needs to support the entire current supply industry through local content policy – including for manufacturers, assemblers, importers, and component suppliers – ensuring fairness across the industry. There are 11 factories across Australia that assemble, design, and manufacture vehicles, with more to come. We must support the whole industry – as it is today – in order to further grow it. This could include a sensibly calibrated mandate for national local content.

We also need harmonisation of standards and specifications for the manufacture of buses across Australia. This would ensure that jurisdictions agree on the same type of specifications for components and localise their production where possible. It could generate economies of scale and drive domestic volumes, creating local manufacturing opportunities and making us less reliant on international supply chains.

Chart 5: Australian Bus Supplier Landscape



Allow the market to choose the right technologies

The right technology depends on the type of bus, the route, infrastructure access, and regional climate.[33] Battery and hydrogen are not always the best solutions, due to cost and infrastructure requirements. Governments should not attempt to pick winners.

The selection of zero-emission technology is highly dependent on specific circumstances. If there is adequate green power and infrastructure, electric vehicles become a viable option. The decision between technologies should be tailored to the vehicle's operational needs, particularly considering the speed and distance of its routes. For instance, stop-and-go city routes at lower speeds consume less energy, whereas operations at speeds above 80 km/h significantly increase energy consumption. Thus, choosing between electric technologies should be informed by the specific tasks the vehicle is expected to perform.

[33] Bus Association Victoria. (n.d). Transitioning Victoria's bus industry to zero-emission buses.

The BIC recommends that a first step would be to prioritise the replacement of all vehicles that are below Euro V. This has cost/benefit advantages over a blanket zero-emission bus rollout. There is also a substantial safety by-product, with newer buses offering safer technologies for passengers and drivers.

We agree with the Australian Government that renewable liquid fuels like biodiesel and renewable diesel will play a critical role in our journey towards zero-emissions.

> 'There will still be a role for many years to come for Low Carbon Liquid Fuels in the heavy vehicle industry, including renewable diesel and biofuels.'
>
> – Catherine King, Minister For Infrastructure, Transport, Regional Development And Local Government

Governments worldwide are offering technology-agnostic subsidies to push their local industries towards electrification targets. In Australia, the quality of collaboration among government, operators, and suppliers will determine the pace of adoption.

Risks of mandating technologies and timelines

The risk to jobs

85,000 Australian workers rely on the bus industry for their livelihood. If the transition to zero-emissions for buses is mandated on aggressive timelines, or with a lack of coordination, or if particular technologies are mandated even though they may not be the best for the task, Australia risks serious disruption to the industry and workers.

The bus industry adds nearly $10 billion annually to our economy. Including companies like parts suppliers, up to 40 local and international companies are involved in bus assembly in Australia.[34] Rushing the transition or mandating specific technologies will mean higher costs that will lead to the closure of businesses and the loss of jobs throughout the bus supply chain. Over the past 12 months, Mercedes Benz, Hino, and Ebusco have closed or paused operations in Australia due to higher costs, the weight of regulation and state government procurement policies.

The risk to community safety

Australia should gradually and carefully roll out zero-emissions technologies to ensure the safety of Australian workers and passengers. Safety must be paramount and should be verified by industry experts at every decision point before broadening the use of these technologies further. To ensure a safe transition to zero emission buses, the following steps are essential:

- **Train first responders:** It is crucial to consider the input of first responders, such as fire departments, before broadly implementing new zero-emissions technologies. Fire departments must be highly trained in the safest way to approach incidents involving zero-emissions vehicles to ensure the safety of personnel and the public. Training programs must be nationally harmonised.
- **Bus-specific safety policy:** Australia must adopt a 'bus-specific' policy rather than relying on generic 'heavy vehicle' factors. This is vital to enhancing passenger safety by ensuring a comprehensive understanding of technical issues related to the construction, operation, and maintenance of zero-emissions buses specifically.

[34] Bus Industry Confederation, Bus Manufacturing - 2020 Fast Facts.

- **Relevant regulations for Australia:** We must continue to update the Australian Design Rules and Heavy Vehicle National Law to include practical provisions on safely designing and operating buses with zero-emission technologies. This is not only for safety but also to accommodate the specific requirements of each technology – such as allowances to carry the higher weights/masses associated with zero emission technologies.

  It is critical that state standards and regulations mirror their federal counterparts. While there is currently a lack of such harmonised regulations – especially for fuel cell electric vehicles – the BIC is producing three industry advisories referencing appropriate international regulations to assist our industry and government.

Australia needs a nationally harmonised policy framework

The BIC recommends that the Australian Government work through National Cabinet to collaborate with state and territory governments on establishing a harmonised framework allowing bus industry participants to operate seamlessly across the country. Unified policy settings across the country would support the development of a safe, efficient, and technically successful energy transition along a number of dimensions, including the following priorities:

Upskilling Australian workers and building social license

New technologies mean new jobs. Whether its dealing with high pressure gas, high voltage, or high-tech charging infrastructure, we will need acceptance of these new technologies by our workforce. Zero emissions vehicles drive differently and our drivers will need to be trained in driving these vehicles.

The transition to electric buses brings a once-in-a-century opportunity to build a new class of skills across the bus supply and operations chain. We must expand our workforce's knowledge of issues like safety protocols, charging capabilities and technical repairs. We will need to sure-up local expertise in every community to enable prompt and skilled servicing of bus fleets. Workers must be trained in how to carefully operate, maintain, and repair electric vehicles, as well as how to produce, handle, store, and use hydrogen.

As we grow the share of green energy on the grid, it is likely that up to **168,000** workers will need training in the new skills required for both vehicles and infrastructure.[35] The BIC has already invested in partnering with vocational education providers, like Ausmasa (the Mining and Automotive Skills Alliance) and the state TAFE system to establish training for battery electric technologies and similar training is under development for fuel cell electric.

Harmonisation of state-based programs is essential; otherwise, the BIC needs to duplicate its efforts up to 8 times for different states and territories in Australia.[36] Government must look to industry to support this workforce transition path, not reinvent the wheel.

Australian governments and industry must earn 'social license' from the community for a wide-scale rollout of zero-emissions technologies for buses. Bus drivers are the face of our industry so they must understand the benefits of zero-emissions buses, support their introduction, and be able to explain their benefits to the public. Communities will need to

[35] Rob Kelly. (February 2023). Accenture. Australian Industry Energy Transitions Initiative.
[36] Transgrid. (August 8, 2023). How upskilling Australians could be the game-changer in accelerating our clean energy transition.

accept the build-out of renewable generation infrastructure, as well as transmission and distribution infrastructure.

The BIC recommends a nationwide government-funded education campaign to build support for zero-emission technologies. The education campaign could highlight the advantages of transitioning to cleaner buses – for both the community and the economy – including the number of clean energy jobs that will be created. Australia must gain the trust and backing of the community, including bus workers and passengers, by bringing them along on the journey towards zero-emissions.

Nationwide infrastructure rollout

Australia needs a harmonised plan to build a nationwide infrastructure network that can seamlessly integrate electric buses into the existing transport system. Australian Government funding could be deployed to fund infrastructure projects, while approval processes related to land use and zoning are streamlined. It is critical that state & territory approaches to these issues are unified – Australian rail productivity is still complicated by significant variations in the width of rail gauges that were laid up to 150 years ago. Whole-of-government solutions are also needed to streamline planning approvals, with priority given to projects that deliver reduced transport emissions.

National industry power purchase agreement

A national industry power purchase agreement (PPA) would allow the bus industry to buy energy in bulk, offering the potential for more stable and possibly lower energy costs. By securing electricity through bulk purchases, the bus industry could more effectively manage the power demands of charging infrastructure for zero-emission buses. Governments could help to facilitate the development of such a PPA.

Recommended next steps

Establish an Office of National Heavy Vehicle Industry Coordination

The Australian Government should fund a new Office of National Heavy Vehicle Industry Coordination (ONHVIC) to facilitate the development and implementation of a National Heavy Vehicle Transition Plan harmonising the nation's regulations and guiding the investments needed for the heavy vehicle industry to lead the energy transition. This would include a national heavy vehicle manufacturing plan and long-term procurement roadmap, which would clearly identify the timing and scale of procurement by state and territory governments.

ONHVIC could convene members from the heavy vehicle industry, scientists, academics, and educators, and would be tasked with delivering a detailed Transition Plan that the Australian Government could, with its amendments, present to National Cabinet. The ONHVIC would work closely with state and territory governments, manufacturers, industry peak bodies, unions, and research organisations.

The Transition Plan could then be formalised in a Memorandum of Cooperation (MoC) between the Australian Government and the States & Territories.

The Australian Government could tie future federal grants that are negotiated with the states and territories to commitments that those jurisdictions will implement this unified national framework for energy transition for the heavy vehicle industry.