



Inquiry into electric buses in NSW public transport networks

20 December 2019

BusNSW is the peak body for the NSW private bus and coach industry. Our members provide essential services and provide a key interface with the travelling public. BusNSW's mission is to foster the efficient and sustainable growth of public transport in NSW, and to promote the benefits of bus travel.

Buses play a vital role in delivering public transport in NSW and carry around 332 million passengers annually, including almost 580,000 students travelling to and from school each day. More passengers are carried by bus in NSW than by any other mode including rail. The flexibility offered by buses, their ability to operate at short notice along a myriad of routes and with a minimum of infrastructure spending, and their capacity to carry a variable passenger load make them an ideal solution to meet a range of transport needs.

BusNSW Members provide bus services under Transport for NSW contracts in Sydney metropolitan and outer-metropolitan areas, and in NSW rural and regional areas. They also provide "non-contracted" services in the long distance, tourist and charter sector. BusNSW also represents a wide range of bus manufacturers and other industry suppliers as Associate Members. Traditionally our members have been at the forefront of innovation, embracing new technology to provide the highest standards of safety and customer experience.

Governments around the world are taking action to prepare for and accelerate the adoption of Electric Vehicle technologies, in recognition of the economic, social and environmental benefits. BusNSW acknowledges that the NSW Government has published an Electric and Hybrid Vehicle Plan to reflect the growing focus on future mobility and technology innovations which will modernise transport for the community and businesses across New South Wales.

BusNSW understands that the focus of the inquiry is to look at the benefits of electric buses and the barriers to their wider use in city and country public transport networks. This includes examining the opportunities and challenges of transitioning the whole metropolitan bus fleet to electric as well as what energy and infrastructure is needed to support electric bus fleets. The Committee is also keen to hear about how local manufacture and assembly of electric buses can be supported.

Globally, manufacturers (including many BusNSW Associate Members) are investing in the development of Electric, Hybrid and Hydrogen based technologies for buses and coaches. As a result, the transition to electric buses and related technologies provides an exciting opportunity for the private bus industry to partner with its stakeholders and to provide its input and experience to ensure the best outcomes are achieved for the industry and ultimately the travelling public.

Outlined below are BusNSW's comments in response to each of the Committee's Terms of Reference.

1. Benefits of electric buses and factors that limit their wider uptake

Battery Electric, Plug in Hybrid, Hybrid and Hydrogen fuel cell vehicle technologies allow governments to address the environmental concerns associated with pollution and emissions from the existing bus fleet. This in turn has broader economic and social benefits. These technologies provide an energy source that is cleaner than oil, resulting in lower carbon dioxide and air pollutant emissions including nitrogen oxide and particulates. The cleaner and quieter vehicles provided by this technology create more liveable communities and better health outcomes for the population. They also have the potential to improve public perceptions of bus travel and thereby grow public transport patronage.

However, there are a range of factors that may limit the take-up of electric vehicles. These include:

- **Cost:** It is unclear how the cost of electric buses compares to traditional diesel vehicles. This has an impact on Government procurement (outlined in more detail in Section 4). Generally, the bus industry would look to assess that the whole of life cost for electric buses should be the same or better than current vehicles.
- **Complexity:** Bus operators conduct regular passenger services on behalf of the Government. As a result, it is important that the necessary Government policies and infrastructure is in place to smooth the path for transitioning to electric. Government may need to consider a new business model to run electric buses where its partnership role and risk is clearly quantified. Bus operators should not be burdened with making major and sudden changes to operational practices including refuelling, maintenance, fleet and parts compatibility, and new regulatory and compliance regimes.
- **Vehicle Supply:** Currently NSW bus operators purchase buses under contract from a Government Procurement Panel. Larger diesel buses generally have a long contract life of around 25 years. In the past, bus operators have experienced difficulties when spare parts for certain models of bus are no longer available, especially towards the end of their contract life. There is therefore a need to ensure the long-term supply and support of chassis and body components for electric buses.
- **Electricity supply:** There is similarly a need to ensure the supply of electricity is stable and abundant and is procured in a way that meets governments environmental goals and the economic expectations for operators. This issue is explored later in this submission.

In all these areas, the NSW Government's engagement and consultation with the bus industry is critical, particularly given the Government contracts which will be needed to cover both electric bus trials and the gradual transition to an electric and hybrid fleet.

Given the level of changes needed and the fact that engineering development of electric vehicles and options for generating electricity are continually evolving, BusNSW would recommend that the introduction of electric vehicles and technologies be managed on a

gradual basis according to short, medium and long-term strategies. These strategies should not be a one size fits all but also be broken down to further consider the varied operating conditions and requirements throughout the state.

2. Minimum energy and infrastructure requirements to power electric bus fleets

A holistic approach is needed for infrastructure to align each of the operating networks with the preferred bus asset, charging option/s and charging strategies. Bus depot location, size and age need to be considered for suitability.

To this effect, BusNSW considers that the opportunity to transition to electric vehicles should initially be limited to urban operations. Urban operations provide the necessary scale to benefit from a whole of lifecycle perspective whilst providing higher environmental and social outcomes than that in regional areas.

BusNSW would recommend that a thorough route analysis be undertaken for each of the 14 metropolitan bus contract regions to determine the required minimum energy and infrastructure requirements needed to power an electric fleet. This analysis should include:

- hours of operation
- peak vehicle requirements
- route lengths
- route conditions (curves, elevations, and temperature ranges along the route)
- scheduling

The ability to provide appropriate charging stations throughout a network of routes will be challenging for both short and long-term network planning. BusNSW would also like to see the development of standards for electric bus infrastructure to ensure the safe and consistent take up of the technologies across the state by the industry.

Bus services are generally at capacity during the morning and afternoon peaks. Energy and infrastructure requirements which are capable of charging fleets outside of these daily peaks and can power vehicles at least until each peak period ends would help to avoid a situation where buses are unavailable during peak periods because of charging.

BusNSW recommends that hybrid be considered for certain operations. Full electric buses use the least emissions but have a high reliance on base load power (which can involve higher emissions to produce the electricity). Hybrid buses have low emissions and a lower reliance on base load power. The use of geo-fencing technology can be used to control where the electric or diesel motors are used, allowing the operator to have vehicle flexibility within its network, combined with the ability to meet environmental and social goals within a defined demographic.

3. Other renewable, emissions neutral energy sources

The use of other energy sources should form part of ensuring a reliable bus network in NSW.

Currently hydrogen fuel cell technology and biodiesel provide alternate options to power bus fleets. Both these technologies can work with or as part of an electric solution.

Hydrogen fuel cell technology provides zero emission outcomes and generally provides vehicles with lower operating weights and longer ranges combined with easy refuelling. Biodiesel is also capable of providing better environmental outcomes. Biodiesel can be used as a standalone alternative to low sulphur diesel, or form part of a hybrid solution.

Electric buses also benefit from the use of Solar. Solar panels can be used as part of fixed infrastructure or installed on the bus itself to assist in the charging of the electric bus.

The availability of a mix of technologies allows government and operators to find the best option for each route whilst safeguarding service delivery in the event of electrical disruption. All of these technologies should be further investigated for their economic benefits and possible use to compliment a fully electric bus fleet in the metropolitan area, as well as for use in the outer metropolitan and rural and regional areas.

4. Ways to support manufacture and assembly of electric buses in NSW

BusNSW Associate Members are actively pursuing the development of electric bus manufacturing. Future development is dependent upon manufacturers having a clear understanding of Government policy to transition to Electric Vehicles. Information on procurement numbers, new vehicle specifications and expected outcomes are required to allow manufacturers to confidently invest in this area of their business. Once manufacturers and suppliers have a clear understanding of Government's commitment to electric bus procurement, significant economic outcomes would be created through research, design and employment.

In NSW, buses purchased by private bus operators for use on Government contracted services (i.e. route and school services) must be chosen from a Bus Procurement Panel where they have pre-approval from Transport for NSW. This Procurement Panel determines the contract bus makes and models available for purchase by bus operators. A review of the Transport for NSW Bus Procurement Panel will therefore be needed to ensure that procurement specifications for electric buses align with the current contractual arrangements with bus operators and suppliers as well as the Government's broader vision for electric buses.

The procurement process provides Government with an opportunity to mandate or include electric buses and bus components (including charging stations and other infrastructure) as part of Government procurement. Technology grants, research and development grants, payroll tax exemptions and employment incentives could also be considered to support Australian manufacturers to provide innovative solutions to government.

The current bus procurement climate is highly variable. Procurement lulls are interspersed with periods of high demand which causes demand stress in other areas of the sector and discourages manufacturers. BusNSW would therefore recommend that a more structured approach is taken to electric bus procurement to allow the bus manufacturing industry to better plan the supply cycle. NSW and Australia more generally need to ensure a suitable supply network to support electric bus development and operation including after sales service. This would help ensure the retention of qualified and experienced tradespeople with specialised skills.

5. Experience with introducing electric bus fleets in other jurisdictions

a. Premier Transport Group Electric Bus Trial

In January 2019, the NSW Government announced a Zero Emissions Bus Services Trial, utilising electric vehicles. The trial involved Premier Transport Group (a BusNSW member) using Yutong's new electric bus. Under the trial, Premier operated the electric bus on a route between Bomaderry and Kiama rail stations on the NSW south coast, Monday to Friday for six months. Yutong, Yutong Australia and Yutong Care provided the electric bus used in the trial and technical staff, while Premier operated the bus service and employed the bus drivers involved.

The purpose of the trial was to obtain data on all aspects of bus operations under Australian conditions to enable the parties to evaluate and assess issues from cost to future needs and direction.

The bus trial was part of a broader range of electric vehicle initiatives announced by the NSW Government which included:

- a minimum 10 per cent of new government fleet vehicles being electric or hybrid from 2020/21,
- \$3 million investment on fast car charging points on major regional corridors such as the Newell, Great Western, Barrier, New England, Pacific and Princes Highways and the Hume Motorway,
- \$2 million for new charging points in commuter car parks.

b. Transit Systems – Region 6

BusNSW is also aware that the contract to provide bus services in Sydney Metropolitan Region 6, awarded to Transit Systems, which commenced in July 2018, included the use of electric buses within the fleet. Transit Systems are currently trialling four electric buses in Sydney's Inner West.

The electric buses are manufactured by BYD-Gemilang and meet Australian Design Rules. The trial will measure the benefits of fuel and maintenance cost savings, cleaner and quieter bus services and reduced emissions as well as monitoring customer comfort.

It is recommended that the Committee seek information from both the Premier Transport Group and Transit Systems about their specific experience in the use of electric vehicles in the Sydney and Outer Sydney metropolitan bus fleet.

c. Bendigo Battery Electric Vehicle Route Bus Project

BusNSW is also aware of the **battery electric vehicle route bus project** which recently took place in Bendigo. The project aimed to provide the basis for a trial of a Battery Electric Vehicle Route Bus (BEVRBs) system in Victoria. BusNSW would refer the Committee to Transport Safety Victoria for more detailed information on this trial.

6. Opportunities and challenges of transitioning the entire metropolitan bus fleet to electric

Opportunities:

a. Patronage Growth

As mentioned in Q1 above, transition to an electric bus fleet would result in positive environmental and economic benefits. This combined with cleaner and quieter vehicles create more liveable communities and better health outcomes for the population and have the potential to improve public perceptions of bus travel and thereby grow public transport patronage.

b. Employment

Electric vehicle technologies have the potential to provide much needed job opportunities for Australia's automotive manufacturing industry. These jobs would cover a range of skills within the industry from software development to vehicle/component manufacturing and maintenance and servicing.

Challenges:

a. Training

While the employment opportunities presented by electric buses are significant, the need for an "electric ready" workforce presents a significant challenge. There is need for the development of accredited training qualifications and pathways for mechanics and workshop staff to address the safe handling of high voltage systems for electric buses. Broader training will be also necessary to develop the new skills required to address changes to business practices and work health and safety, particularly for bus drivers and operational staff and contractors. Manufacturers and suppliers will also require access to coordinated skills training and re-training initiatives to alleviate the effects of industry restructuring on workers.

The annual Transport and Logistics Skills Forecast which seeks to identify skills needs for the immediate future and anticipate what will be required over the next four years. Information for this forecast emanates from research and extensive industry consultations including the Australian Industry Standards Industry Skills Forums and an industry survey. Future Vocational Education and Training (VET) packages used by the

bus and coach industry will need to include the operation and maintenance of electric bus fleets.

b. Charging

The charging of electric buses can occur at depots, layovers or on route. Due to the significant cost of using pantographs on route and the limitations they place on route design and flexibility, most battery electric buses are charged at the depot or a layover facility.

Many manufacturers offer a range of charging options and vehicles commonly come with combinations of both fast and slow charge components. The time needed to charge vehicles is closely linked to the available power supply, battery size and chemistry. Smaller batteries may be recharged in less time than larger batteries using the same charge station, provided they can accept the rate of charge. It is therefore important to coordinate the charging station capacity with the specific vehicle requirements.

Whilst charging time is an important consideration, the total battery capacity also needs to be quantified as the amount of “usable energy” can be typically only 50 to 80 percent of the total battery capacity. Usable energy will determine the operating range of the bus.

Flexibility of charging is paramount to ensure bus availability. To manage charging demand for electric vehicles, new infrastructure will be required in depots together with upgraded utilities. Ensuring a secure, reliable and affordable electricity supply is essential for full transition of an electric fleet.

c. Vehicle Specifications and Charging Standards

With charging it is important that a single charging standard for buses is implemented. BusNSW understands that there are different types of AC/DC conversion depending on the manufacturer. Given buses often move between depots and localities, the NSW Government should consider the regulation of a standard to ensure that buses supplied by different Original Equipment Manufacturers have compatible plugs and charging devices.

d. Mass Limits

Another important consideration in this context is the weight or “mass” of a vehicle. Currently under National Heavy Vehicle Law the maximum gross mass for a 2-axle bus is 18 tonnes, while mass for 3 axle buses is limited to 22 tonnes. Breaches of these limits leads to penalties and fines issued by police or TfNSW (RMS) Heavy Vehicle inspectors.

Battery packs are notoriously heavy relative to the amount of energy they can store. Battery weight and the weight of other componentry is a vital consideration for electric bus policy since battery mass could lead to non-conformance of current axle mass regulations. As a result, the transition to electric buses may need a formal review of

mass limits at the national level or the introduction of a permit system to enable electric buses to legally travel on NSW roads.

e. Life of Electric Bus

In NSW, buses purchased under government contract have an expected life of 25 years and 365 days (essentially 26 years) for larger vehicles. The lifespan of electric vehicles in the Australian context is simply unknown. Trials have provided data on the cost of maintenance however no electric vehicle has operated for a period comparable to the 25 years expected of diesel equivalents. Another challenge is the as-yet unknown end-of-life costs, for example battery resale into Australia's emerging stationary energy market, battery recycling and remanufacturing, and disposal of the electric vehicle and batteries. In the lead up to the March 2019 NSW State Election BusNSW recommended that a plan should be developed to transition the fleet to a lower maximum age over several years and should include the phasing in of electric and semiautonomous vehicles. The NSW Government supported a review of the average and maximum age profiles as part of the next generation of Bus Services Contracts.

f. Reliability of Vehicles

A related issue is the reliability and availability of electric vehicles. The transition to electric buses will be compromised if these vehicles have a significantly higher breakdown and failure rate. Such issues must be closely researched and monitored via trials before the decision to "go electric" is fully implemented.

g. Depots and Service Contracts

Most depots in Greater Sydney and Regional NSW are owned by private bus operators. Contracts have different end of term provisions and the NSW Government has used different procurement strategies to renew contracts.

The NSW Government recently announced a three-year program to procure metropolitan bus services for Sydney, which will involve the franchising of three State Transit operated regions and tendering of ten private bus operator regions. The announcement also advised that as part of the process, there would be an ambitious transformation of the bus fleet from diesel to zero-emission buses.

Where an incumbent operator has previously not been the successful proponent in a tender, they had an opportunity to lease their depot, which is predominantly hard stand, to a third party for other business activities (i.e. a trucking company). In some cases, the depot sites have the potential for redevelopment, including industrial, commercial and residential.

The installation of infrastructure for the charging of electric buses in depots will significantly impact on the hard stand area and on the leasing and redevelopment options for the owners. Consideration should therefore be afforded to the commercial arrangements between government and operators to manage the ongoing ownership and availability of infrastructure to support an electric bus network.

h. Procurement of Bus Services

The NSW Government's plans to transition the diesel fleet to a zero emissions fleet will mean considerable change for bus operators during the next contract terms. There is significant uncertainty regarding the cost impacts of operating electric buses over the medium to long term, and a limited understanding of how key performance indicators that are related to the operation and maintenance of the fleet will be affected.

The NSW Government uses a number of different procurement strategies to procure bus services which include open tenders, direct negotiations with operators and industry-based negotiations, which are all designed to ensure there is a fair market outcome for taxpayers. There will be a need for each type of procurement to have mechanisms that facilitate a fair allocation of risk in regard to the uncertainty around operating a fleet that has a growing proportion of electric buses during the contract term. As demand for electricity to charge electric bus fleets grows there is a risk of electricity providers increasing prices.

i. Heavy Vehicle Road Reform

The Australian Government is working with state, territory and local governments, as well as industry and community stakeholders, to progress Heavy Vehicle Road Reform. This work is being overseen by the Transport and Infrastructure Council.

Future changes to how government collects heavy vehicle road user charges may impact on the cost of operating electric vehicles and should be considered when making comparisons with the operation of diesel buses. BusNSW and some of its members are involved in a National Heavy Charging Pilot which is an innovative industry partnership testing potential direct user charging options for heavy vehicles.

j. Climate

The climate in NSW requires buses to be fitted with air conditioners to ensure passenger amenity. Bus air-conditioners provide a major technical challenge for electric vehicles as the air conditioner draws a large amount of the available energy used to power the bus. This consumption of this energy by the air conditioner has subsequent effect on the vehicle's operating range and charging requirements.

7. Any other related matters

a. Integration

There is a significant amount of change currently occurring within the NSW bus transport sector. The Government is trialling autonomous vehicles, on-demand bus services, ride share and other initiatives. Extensive infrastructure investment is also scheduled as part of the Future Transport Strategy 2056. It is therefore essential that electric bus policy development does not occur without proper industry consultation and that these other initiatives are considered at the same time as electric bus policy.

b. Safety: Mechanics and Emergency Personnel

Another issue warranting attention are potential safety issues associated with electric buses. Almost a century of experience with diesel engines has given mechanics, emergency personnel and others a comprehensive understanding of safety issues associated with repairing, servicing and responding to emergencies with traditional vehicles.

The same cannot be said for electric vehicles. For this reason, on 1 September 2019 the NSW Government announced changes that require electric, hybrid and hydrogen vehicles manufactured or modified after 1 January 2019 to have a safety label fixed to the front and rear number plates.

The labels are intended to help Emergency Services staff and first responders in the event of a crash. Vehicles can be quickly identified as having an electric or hydrogen components, so that specific procedures can be followed to make the incident safer for all present. These types of labels and other safety initiatives may need to be extended to on road and depot infrastructure to ensure the safety of transport workers and the broader community.

c. Safety: Pedestrians and Road Users

There is a further safety dimension associated with electric buses. The greatest hazard associated with bus travel involves pedestrians, bike riders and other road users crossing the path of a bus. Electric buses are far quieter than traditional heavy vehicles and have the potential to increase injuries and fatalities to pedestrians and others unaware of their proximity. Campaigns will be required to promote safety around electric buses.

d. Autonomous Buses

Driverless vehicles and automated technology have the potential to increase safety, minimise congestion, improve productivity and help make people more mobile. Electric powered driverless shuttle bus trials are occurring in NSW.

e. Regulation

Electric bus and its associated technologies are advancing at a rapid rate. It is therefore important that Government develops standards and associated regulations that keep pace with the change. Buses carry precious cargo and passengers' safety should be at the fore front of any requirement to implement electric buses. BusNSW recommends that the NSW Government undertake a thorough review of Passenger Transport and Road Transport legislations to consider any changes required to support the operation of electric buses.

Thank you for the opportunity of contributing to this important inquiry. If you would like to discuss these comments in more detail, please contact me on (02) 8839 9500.

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