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EVC Response to Consultation on Victoria's ZEB Transition

The Electric Vehicle Council (EVC) welcomes the opportunity to respond to this consultation on Victoria's Zero-Emission Bus (ZEB) transition. The EVC is the national peak body for the electric vehicle (EV) industry in Australia. Our mission is to accelerate the electrification of transport for a sustainable and prosperous future. We represent members across the EV value chain, including car, bus and truck manufacturers, importers, operators, charging infrastructure suppliers and network providers.

Overview

Transport makes up almost one-fifth of Australia's emissions and 25% of Victoria's emissions, with the vast majority of this attributed to light vehicles, followed by trucks. Unfortunately, transport is also the greatest laggard when it comes to achieving our emissions reduction targets. Current projections suggest that without government action, Australia's transport emissions will likely be significantly higher than 2005-levels in 2030 – undermining the economy-wide target of a 43% reduction. This places undue pressure onto Australian farmers, manufacturers, energy suppliers, and other local businesses to offset transport-related emissions.

As the energy system rapidly decarbonises, it is likely that the transport sector will become Australia's top emitting sector in the near future. While much of the technology is already available to decarbonise transport, the challenge for this sector is time; specifically the amount of time it takes to turnover the vehicle fleet. As such, prioritising decarbonisation of this sector today will be crucial achieving net zero emissions before 2050.

Within this context, ZEBs are set to play a key role. Battery electric buses have already demonstrated cost competitiveness compared to their diesel counterparts. Beyond economic benefits, they offer substantial environmental and health advantages, curbing noise and air pollution while providing affordable transit options that reduce private car dependency, which will also be key to displacing transport related emissions.

Despite this, Australia lags behind global counterparts in uptake of electric buses and deployment of necessary infrastructure. Promptly electrifying bus fleets constitutes an initial, impactful step that state governments can take towards achieving net-zero objectives and decarbonising transport. This is particularly vital considering that other transport segments, like freight, will require extended timelines for decarbonisation. Accordingly, a proactive approach to electrifying buses will be critical in attaining Victoria's net-zero target by 2045.

Transitioning Victoria's Bus Fleet

The EVC is very supportive of the Victorian Government's commitment to progress beyond trials to only procure ZEBs from 2025, as part of a broader strategy to transition the 4,500-bus fleet. The various ZEB trials underway and Metropolitan Bus Franchise contract will provide vital information to inform the broader transition. We note that based on expected timeframes for implementation, Victoria's ZEB transition is currently poised to outpace New South Wales, with the latter extending its transition timeframe to 2040 and 2047 for metro and regional areas respectively.

We understand that of 52 ZEBs being trialled, 50 are battery electric and 2 hydrogen fuel cell. Studies from existing trials and bus deployments across the country have consistently shown that battery electric buses offer the most cost-competitive option when considering total cost of ownership, with long-term benefits far outweighing costs of initial investment in vehicles and requisite energy infrastructure at bus depots. Transitioning to electric buses will significantly reduce air pollution and contribute to a cleaner environment for Victorians, which will only improve with decarbonisation of the Victorian energy system.

Infrastructure Needs and Opportunities

A key priority for the ZEB transition beyond procurement of vehicles, will involve effectively planning infrastructure installation in a manner that appropriately considers the range of different operators across the industry. While some operate large fleets across multiple depots where they are able to deploy charging infrastructure on their own properties, others, such as community and school bus services in regional Victoria, contend with limited vehicles and restricted property resources. For metropolitan bus services, insights from the operating trial at the Footscray Depot with Evenergi/BetterFleet will be able to inform future requirements.

Energy requirements

The EVC notes from the consultation paper a very high level, and potentially misleading, power requirement description:

> **Bus power requirements at the state level**
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> It is estimated a depot will require approximately 1 MW of power for every 20 buses. For Victoria's fleet of 4,500 buses, that equates to 225 MW of power charging the buses overnight. Once the bus network is fully electrified, the total energy required is estimated to be up to 250-300 GWh per annum (depending on emerging technologies and fleet composition).
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> Depots of different sizes are likely to require a different energy response:
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> - **Up to 20 buses** – often there is enough existing power available to not require electricity supply upgrades
> - **20 – 50 buses** – some upgrades to electricity supply may be needed, such as a new fuse box
> - **Over ~50 buses** – larger upgrades to the power supply may be required, such as new substations.

Unpacking this in a little more detail is warranted, with the goal of identifying which sites should be prioritised, on the basis of being 'lower hanging fruit'.

The '1MW capacity per 20 buses' figure implies 50kW per bus. If we assume the buses are generally charging between midnight and 6am, this provides for 300kWh of energy per bus, per day, which is likely adequate for the majority of cases. Some locations will be able to get away with less, some will require more, but this is a reasonable starting point.

At 50kW per bus, site level electrical system upgrades will often be required for a single bus. At minimum, this will be the addition of new circuit breakers in the existing main switchboard. In many cases, replacement of the main switchboard, and upgrade to the size of the network connection will be required. Where the location of the charging is on a SWER line (common outside of townships in regional areas), the upstream network may not be able to support more than one bus. For this reason, **immediate review** of locations supporting buses in regional areas, to identify which depot/charging locations are currently supported by SWER lines, would be appropriate.

Prioritising smaller depots and charging locations

Those sites supporting small numbers of buses, where the existing network supply to the property won't support a three phase connection of at least 70A per bus, will require significant investment, or re-location. Locations with small numbers of buses, that are able to support three phase connections, should likely be done first – this will be common in regional locations where the charging happens within a township. Consideration should be given to arrangements that limit the charging activity to off-peak hours – this will enable more buses to be supported, with less network augmentation. Close consultation with Powercor and Ausnet will be required on this point.

Transitioning the smaller sites first will mean that more sites will need to be electrically upgraded to transition the same total number of buses - but each small site will be far easier to transition than each large site, and it will be possible to transition a multitude of small sites in parallel without any significant disruption to existing operations.

Spare capacity in the local low voltage network will determine the point at which augmentation to that network will be required. Where the site requirement is to support more than 5 buses (i.e., > 250kW), it should be assumed that a new transformer will be required. Where this transformer is deployed and owned by the DNSP (the local energy network), it is termed a 'distribution substation', (as distinct from a 'zone substation'). Regardless of ownership, this asset will need to be paid for at the time of the deployment of the new electrical infrastructure. For context, transformers up to 500kW are commonly mounted on or adjacent to power poles.

If the depot is not adjacent to an existing 11kV or 22kV feeder, supporting more than 10 buses may require significant work on the part of the distribution network to bring sufficient supply to the location. Where an existing 11kV or 22kV feeder is adjacent to the site, upgrade works will generally be more straightforward, whether the new transformer is owned by the network, or owned by the site owner. For this reason, an **immediate review** to identify which depots hosting more than 10 buses are adjacent to 11kV or 22kV feeders would be appropriate. Those sites with more than 10 buses, which are **not** adjacent to 11kV or 22kV feeders, will require more planning, and it may be appropriate to defer them. Among sites supporting 10-50 buses, those with adjacent 11kV or 22kV feeders should be done first.

For those depots with more than 10 buses, replacement of the site main switchboard, coupled with securing an adequately sized network connection (50kW per bus, plus whatever additional site loads are required), should be planned for. If it is possible to guarantee that the load from the site will only present at off-peak times, then it should be possible to avoid feeder upgrades for many sites. A typical 11kV feeder will have total capacity of 5MVA. In the middle of the night, more than half of this capacity will typically be consistently available, meaning that feeder upgrades should generally be avoidable for sites with up to 50 buses.

This will require case-by-case review, and agreement with the DNSP – not all feeders are the same, and the expectations of the DNSP with respect to providing certainty that large loads will be adequately managed may vary. Simple techniques may be used to provide certainty – for example, one approach would be for the site level software to be programmed to keep the load in the agreed off-peak hours, but to back this up with a much simpler, independent system designed to disconnect the supply to the chargers in the event that the agreed load profile is exceeded through misbehaviour of the software – the purpose being to ensure that other energy users on the same feeder are not disconnected from supply.

Leveraging smart meter and network capacity data

In Victoria, the ubiquitous deployment of smart meter data will mean that the DNSPs have all the required information with respect to capacity. Government engagement to direct DNSPs to publish of feeder capacity and historic utilisation data may be required. There is no reason that this information should not be public; capacity and utilisation data at the zone substation level is already mandatorily published.

It should be noted that feeder capacity may vary over the length of each feeder. It would be appropriate to capture this where applicable in the published data.

Publication of this data would be a no regrets measure that would support many other parties engaging with the energy networks for new connections, for example the deployment of public fast EV charging facilities.

Upgrade requirements for medium-size operations

Sites with more than 20 buses should give consideration to connecting to the feeders as 'high voltage customers' rather than to the low voltage distribution network. This approach will provide project managers with more options with respect to transformer procurement and deployment, which will typically enable faster project completion.

For the ~20 sites in Victoria with more than 50 buses, consideration will need to be given to bringing a new feeder from the zone substation to the bus depot, or supplying the depot from multiple feeders, or re-locating the bus depot to a location better suited to large supply from an electrical network perspective. This will be expensive, complex, and time consuming, but the techniques are well understood – the electrical industry routinely handles similar requirements for large industrial premises, hospitals, data centres, and the like.

New zone substations should not be required, provided charging happens off peak, because as with feeder capacity, zone substations will generally have ample spare capacity overnight. Zone substations are typically in the 15-30MVA range – meaning that 50% of a zone substation's capacity will support 150-300 buses charging overnight at 50kW each. These assets are not the same as "distribution substations"; "zone substations" take up real estate and take years to plan and deploy.

Larger sites

For the largest sites, it would be prudent to identify available land adjacent or proximate to existing zone substations which have the potential to serve as bus depots for more than 100 buses, in locations within a few kilometres of the existing depots where more than 100 buses are being supported. Construction of new sites capable of supporting a large number of electric buses could be executed without disrupting existing operations, in an efficient manner. This approach would be capital intensive upfront – so would require very well-designed contractual engagement between government and private sector participants - but it would significantly de-risk the overall transition for the larger fleets.

Ideal locations for this purpose would be light industrial properties that are standing unused – for example, disused manufacturing plants. Compulsory acquisition processes could be reasonably utilised for good candidate sites, where the location is currently standing idle. We would strongly recommend executing at least one of these sites early in the overall plan, in order to discover and develop the techniques to manage the challenges that become apparent.

Ensuring adequate transition planning

With respect to charger/bus compatibility, and ongoing support, we note from the consultation paper:

> **Victorian ZEB trial learnings – charging**
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> Various ZEB roll-outs (including those experienced here in Victoria) have demonstrated the importance of compatibility between the charger and the bus, noting the increased interface risk that can impact operations. There have been examples of chargers not working properly, requiring operators to deploy temporary portable chargers. There is a current gap in the Victorian market for locally-based after-sales support from some suppliers.
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> There needs to be sufficient training and planning undertaken with the charging interface to minimise the potential for delays to daily operations. Warranties for charging infrastructure must be considered carefully, with assurances of timely responses to technical issues from locally-based technicians. Early testing of bus charging as part of commissioning should be undertaken, with clear responsibilities for resolving any problems.

Given the nature and importance of the public transport service, the provision of charging equipment should include not just warranty coverage, but also service level agreements, designed such that there is a level of certainty that equipment failure will not result in an inability of the site operator to charge the buses.

This may also mean a degree of redundancy in the site design – for example, if there are 50 buses requiring overnight charging, it may be prudent to deploy 52 charging stations at the depot. Equipment will, from time to time, fail. The design and the planning should account for this, in a manner that can reasonably be expected to deliver acceptable outcomes.

The transition of 4500 buses, over a period of 20 years, implies transitioning about 225 buses per year. The energy system and charging infrastructure side of this transition should not be an impediment, provided adequate attention is paid to those locations likely to prove most challenging, early on in the overall plan.

Managing risks of power outage

A new risk being introduced in this process is that overnight power outages have the potential to result in all the buses at a location not being charged overnight, and this not being known until the morning when the drivers arrive to use them. The risk of an individual vehicle being out of action is not new – mechanical failures are already a known risk with established mitigation strategies – but the risk of all vehicles at a single depot being out of action is new.

To illustrate, a couple of examples:

Example 1: *At a small, unmanned regional depot of 8 buses, the drivers connect all the buses to the chargers by 8pm and go home. The buses are all near empty and will need 6 hours each to charge. Charging commences at midnight, but at 1am a storm takes out the power line feeding the site. It takes longer than 6 hours for the network to reinstate the line. The buses are therefore not charged the next day.*

Example 2: *At a city depot with 100 buses, a dedicated 5MVA feeder from a zone substation 2 kilometres away supplies the site. At 7pm, a truck accident at a location between the bus depot and the zone substation takes out one of the power poles supporting the feeder. Or, if it's an underground feeder, someone undertaking work without calling 'dial before you dig' interrupts the supply. This issue then takes more than 12 hours to fix, meaning the expected supply to the 100 chargers is not available overnight.*

Both of these examples are predictable enough that the risk of unplanned loss of electrical supply to a location (i.e., the consequential impact being that the buses hosted there are not ready to operate on the following day) needs to be mitigated.

Possible solutions/mitigations would include, but not be limited to:

- Telemetry and active overnight monitoring of bus charging, to detect unexpected cessation of charging. For example, if 20 school buses all stop charging at 2am, people will need to be woken up to action contingency plans. This is comparable to monitoring of security alarm systems.
- On site back up generation, sufficiently sized to support the electrical load associated with bus charging, with robust automated systems to ensure that when supply is temporarily unexpectedly lost, once the generation asset starts up, charging automatically restarts without human intervention. This is a common approach in a wide variety of settings.
- Some degree of redundancy in the vehicle fleet, at a regional level, so that if vehicles that are not ready for service on a particular day alternative vehicles are available. This will be more feasible where a large number of depots each serve a relatively small number of vehicles.
- Site design for the largest locations to be served by more than one feeder, such that if one feeder fails, an alternate is ready on standby. This type of electrical engineering design approach is sometimes used in hospitals and is commonly used in combination with backup generation.

Increases in redundancy through mitigation measures like those outlined above will reduce the percentage chance of loss of transport service the following day. Achieving near-100% reliability will likely be prohibitively expensive. One of the roles of government will be to determine precisely what level of service is acceptable, so that appropriate mitigations in design and operation can be budgeted for and executed.

Ongoing Information and Data Sharing

An efficient ZEB transition will rely upon accurate information and data sharing to ensure a comprehensive understanding of energy requirements, infrastructure deployment, route optimisation, smart charging strategies, and lessons learned from change management and behavioural considerations. Ongoing monitoring and evaluation will be vital to ensure optimal performance throughout operation of ZEBs on Victorian roads.

Real-time data captured from on-board loggers during existing trials provides valuable insights for maintenance and operational purposes. Supporting bus drivers and operators during the transition through comprehensive training is equally important. The knowledge gained should be disseminated broadly to assist smaller private bus and coach services that lack the resources to develop detailed transition plans.

Industry Development

Procurement planning should strategically encourage local manufacturing and assembly of electric bus fleets where feasible, fostering local jobs and growth. In coming decades there will also be an opportunity to expand along the ZEB value chain and plan for future reuse and recycling of ZEB batteries. This includes exploring second-life applications for batteries in stationary energy storage systems, taking lessons learned from international successes in electric bus transitions.

For vehicles in operation, the Victorian government may need to consider upskilling requirements for bus operators and for the maintenance and servicing of ZEBs across the state – by working with other jurisdictions to understand different requirements and maintain a nationally consistent approach.

As the state transitions its existing bus fleet, this should also involve end of life considerations for the diesel bus fleet, including potential refurbishment or conversion of existing models where it is cost effective to do so.[1] Collaboration between government agencies, transportation authorities and industry participants will be essential in creating a strategy for the end-of-life phase of these retiring buses.

Intergovernmental Coordination and National Electric Vehicle Strategy

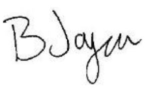
While the Federal Government has taken steps towards national leadership in this space under the National EV Strategy, improved coordination from all levels of government will be critical to accelerate electrification of transport across all segments.

Continued collaboration among federal, state, and local governments will allow the pooling of resources and expertise, leading to more efficient and impactful changes across transport and energy sectors. In particular, harmonisation of regulation across jurisdictions serves to reduce administrative complexity for industry and provide clarity to consumers. As Victoria advances its ZEB transition, partnering with other Australian jurisdictions to share insights and lessons learned will be essential.

If you have any questions on this submission, please do not hesitate to contact Natalie Thompson, Senior Manager - Policy / Ross De Rango, Head of Energy and Infrastructure: office@evc.org.au

Thank you for your consideration of our submission.

Yours sincerely,



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[1] https://www.busnews.com.au/industry-news/2308/eight-double-decker-buses-repowered-in-wales.