

**Submission  
No 10**

**ELECTRIC BUSES IN REGIONAL AND METROPOLITAN PUBLIC  
TRANSPORT NETWORKS IN NSW**

**Organisation:** Beyond Zero Emissions

**Date Received:** 19 December 2019

## [Beyond Zero Emissions](#)

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**19 December 2019**

Committee on Transport and Infrastructure

Dear Ms Robyn Anne Preston,

Thank you for the opportunity to comment on the Inquiry into electric buses in regional and metropolitan public transport networks in NSW.

Beyond Zero Emissions welcomes the opportunity to comment on the benefits of electric buses and factors that limit their wider uptake; the use of renewable, emissions neutral energy sources; and opportunities and challenges of transitioning the entire metropolitan bus fleet to electric. We support a transition to electric buses in regional and metropolitan public transport networks in NSW.

### ***Benefits of electric buses***

Electric vehicles bring a host of benefits, including:

- Zero greenhouse gas emissions (when powered by renewable electricity). Electric buses are also more efficient than internal combustion engine buses.
- Air quality improvements and health benefits: electric buses have zero tailpipe emissions.
- Reduced noise pollution and increased urban amenity: electric buses are near silent. Reductions in bus noise and vibrations increase urban amenity, make streets more pedestrian and cyclist friendly, and may enable intensification of transport services around busy transport corridors.
- Operating cost savings: Electric buses cost significantly less to operate than diesel or hybrid buses and have lower maintenance costs.<sup>1</sup>

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<sup>1</sup> Beyond Zero Emissions, "Zero Carbon Australia – Electric Vehicles," Beyond Zero Emissions, 2016. [Online]. Available:

<https://bze.org.au/wp-content/uploads/BZE-Electric-Vehicles-Report-Beyond-Zero-Emissions-Australia.pdf>. [Accessed 18 December 2019].

- Improved journey for public transport users: a smoother, quieter journey.

### ***Benefits outweigh the costs of electric buses***

Uptake of electric buses has historically been limited by the high capital costs of electric buses and associated infrastructure. High capital costs, however, are offset by lower maintenance and fuel costs. Electric bus technology, especially batteries, is advancing and costs continue to fall. We are rapidly approaching a cross-over point where the lifetime costs of ICEs are greater than that of electric cars.

Modelling by Beyond Zero Emissions shows that under a Low Cost Scenario (with high petrol prices and electric buses reaching capital cost parity with ICEs by 2025), **a shift to 100 per cent renewable electric buses costs almost 12 per cent less than continuing to operate ICE buses** (Figure 1). Even using more conservative estimates for capital, maintenance and battery replacement costs, along with only moderate petrol price increases, the High Cost Scenario sees a shift to 100 per cent renewable electric buses costing only 10 per cent more than business as usual. This amounts to an increase in cost of only \$38 per capita per annum, or \$0.72 per capita per week (Figure 2). For full details of this cost modelling, please refer to Beyond Zero Emission's Electric Vehicles report:

<https://bze.org.au/wp-content/uploads/BZE-Electric-Vehicles-Report-Beyond-Zero-Emissions-Australia.pdf>.

Further, results from AECOM's recent trial of electric buses in Canberra show that when external factors such as greenhouse gas emissions costs are included, **whole of life cost (economic) for electric buses is significantly cheaper than diesel or hybrid buses**<sup>2</sup>.

Recent advances in technology and consequent reductions in total costs have contributed to rapid uptake of electric buses globally, with electric bus fleets operating in Europe<sup>3</sup>, China<sup>4</sup>, Latin America<sup>5</sup> and North America<sup>6,7</sup>. Around 425,000 electric buses now operate worldwide, many of them in China<sup>8</sup>.

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<sup>2</sup> ACT Government, "Electric bus trial results released", Chief Minister, Treasury and Economic Development Directorate, 30 September 2019. [Online]. Available: [https://www.cmtedd.act.gov.au/open\\_government/inform/act\\_government\\_media\\_releases/chris-steel-mla-media-releases/2019/electric-bus-trial-results-released](https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/chris-steel-mla-media-releases/2019/electric-bus-trial-results-released). [Accessed 18 December 2019].

<sup>3</sup> Inside EVs, "160 Electric Buses Expected To Be Added In Sweden", 20 July 2019. [Online]. Available: <https://insideevs.com/news/360778/volvo-160-electric-buses-sweden/>. [Accessed 18 December 2019].

<sup>4</sup> Keegan, M., "Shenzhen's silent revolution: world's first fully electric bus fleet quietens Chinese megacity", The Guardian, 12 December 2018. [Online]. Available: <https://www.theguardian.com/cities/2018/dec/12/silence-shenzhen-world-first-electric-bus-fleet>. [Accessed 18 December 2019].

<sup>5</sup> Inside EVs, "BYD Scored Latin America's Largest EV Bus Order: 379 Buses", 20 July 2019. [Online]. Available: <https://insideevs.com/news/383527/byd-latin-america-largest-ev-bus-order/>. [Accessed 18 December 2019].

<sup>6</sup> Foothill Transit, "Foothill Transit Sustainability", n.d., [Online]. Available: <http://foothilltransit.org/news/sustainability/>. [Accessed 18 December 2019].

Figure 1.

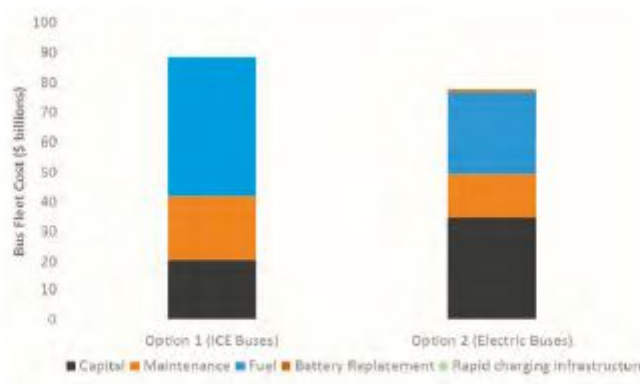


Figure 29 - Bus fleet costs (Net Present Value of total cost during 2015 to 2035) for the Low Cost Scenario. "Fuel" costs in Option 2 include the purchase of renewable electricity to operate buses.

Figure 2.

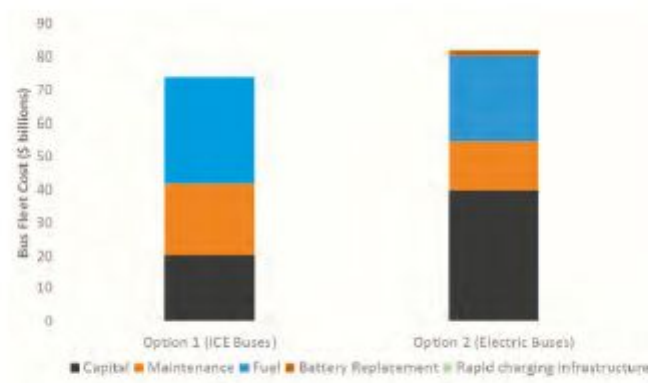


Figure 28 - Bus fleet costs (Net Present Value of total cost during 2015 to 2035) for the High Cost Scenario

<sup>7</sup> Nunno, R. "Fact Sheet: Battery Electric Buses: Benefits Outweigh Costs", Environmental and Energy Study Institute, 26 October 2018. . [Online]. Available: <https://www.eesi.org/papers/view/fact-sheet-electric-buses-benefits-outweigh-costs>. [Accessed 18 December 2019].

<sup>8</sup> Eckhouse, B. "The U.S. Has a Fleet of 300 Electric Buses. China Has 421,000", Bloomberg, 15 May 2019. [Online]. Available: <https://www.bloomberg.com/news/articles/2019-05-15/in-shift-to-electric-bus-it-s-china-ahead-of-u-s-421-000-to-300>. [Accessed 18 December 2019].

### ***Power the electric bus fleet with 100 percent renewable electricity***

The maximum benefits of a shift to an electric bus fleet can only be realised with an accompanying commitment to run these vehicles on 100 percent renewable electricity. Beyond Zero Emission's Electric Vehicles report found that **a rapid shift to electric buses operating on 100 per cent renewable electricity is both feasible and affordable.**

Recognising the urgent need to reduce Australia's greenhouse gas emissions, **we recommend the NSW government mandate electric buses are powered with 100 per cent renewable electricity** in all new bus service contracts.

A commitment to powering the electric bus fleet with 100 per cent renewable electricity will assist the NSW Government in meeting its 2050 net-zero emissions target, and achieve emissions savings as outlined in the NSW [Climate Change Policy Framework](#).

Even before NSW achieves a 100 per cent renewable power system, 100 per cent renewable energy could be purchased by operators of electric bus fleets, via the nationally accredited 'GreenPower' program.

Additional benefits of using 100 renewable electricity to power buses are:

- **Increased energy security** in using local sources of energy, rather than imported fuels
- **Avoided health costs** (exposure to air pollutants) from fossil-fuel based electricity generation
- Proactively drives **investment in renewables**
- Longer-term cost reduction: wind and solar energy are already the cheapest forms of new energy generation in Australia, and costs continue to fall.<sup>9</sup>

Beyond Zero Emissions recommends that the electric bus fleet does not include hydrogen fuel cell buses. A recent study found hydrogen fuel cell well-to-wheel losses are almost as high as fossil fuel vehicles, resulting in hydrogen fuel cell vehicles requiring "three to four times more energy than battery electric vehicles, per kilometre travelled"<sup>10</sup>. Battery powered electric vehicles are the most effective and efficient pathway to zero

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<sup>9</sup> Graham, P.W., Hayward, J., Foster, J., Story, O. and Havas, L. "GenCost 2018 – Updated projections of electricity generation technology costs", Commonwealth Scientific and Industrial Research Organisation. December 2018. [Online]. Available: <https://www.csiro.au/~media/News-releases/2018/renewables-cheapest-new-power/GenCost2018.pdf?la=en&hash=9A292E508F96EEC337F1BFFF4ACDB54BC2DA5CEE>. [Accessed 18 December 2019].

<sup>10</sup> Smit, R., Washington, S., and Whitehead, J. "Why battery-powered vehicles stack up better than hydrogen," The Conversation, 30 November 2018. [Online]. Available: <https://theconversation.com/why-battery-powered-vehicles-stack-up-better-than-hydrogen-106844>. [Accessed 18 December 2019].

emissions for urban passenger vehicles. The technology is proven and is being deployed at scale internationally.

***Opportunities for transitioning the entire metropolitan bus fleet to electric buses on renewable electricity***

We note that bus technology and infrastructure decisions have a lock-in effect, and recommend the NSW Government make a foundational commitment that the electric bus fleet will run on 100% renewable electricity. This will enable Transport for NSW to work with operators and bus suppliers to make sound technology decisions as part of the transition to electric buses. In particular, we note that swappable battery technology opens opportunities for battery-to-grid integration, which can help improve the efficiency of the electricity grid. (16)<sup>11</sup> Combinations of fast-charging infrastructure and battery-swapping technology could contribute to demand management as the share of variable renewables increases, along with lower operating costs.

Beyond Zero Emissions recommends that the NSW Government seek assistance from the NSW Renewable Energy Advocate to investigate mechanisms to create renewable power purchase agreements for electric bus fleets. Purchase agreements such as the recent Sydney Metro/ Beryl Solar Farm agreement<sup>12</sup> would not only enable transport operators to offset operational emissions for electric bus fleets, but also drive investment in renewable energy projects in the State, as per the [NSW Electricity Strategy](#).

Lastly, the introduction of an electric bus fleet has the added benefit of accelerating electric vehicle uptake more generally, raising public awareness of the quality performance and convenience of electric vehicles, and reducing ‘range-anxiety’ concerns.

Beyond Zero Emissions encourages the New South Wales Government to transition the whole metropolitan bus fleet to electric buses powered by 100 per cent renewable energy. This transition makes sense both environmentally and economically. This commitment would demonstrate the NSW Government’s leadership in transforming the transport sector to reduce emissions and drive far reaching positive change for communities and urban environments.

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<sup>11</sup> Beyond Zero Emissions, “Zero Carbon Australia – Electric Vehicles,” Beyond Zero Emissions, 2017. [Online]. Available:

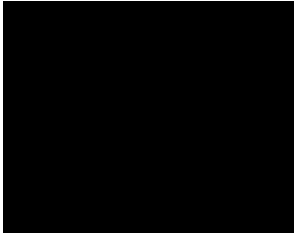
<https://bze.org.au/wp-content/uploads/BZE-Electric-Vehicles-Report-Beyond-Zero-Emissions-Australia.pdf>. [Accessed 18 December 2019].

<sup>12</sup> Stadler, A. and Walgenwitz, G., “Sydney Metro to offset 100% of operational emissions in deal with Beryl Solar Farm”, Energetics Insights, July 2018. [Online]. Available:

<https://www.energetics.com.au/insights/thought-leadership/sydney-metro-announces-ppa-with-nsw-solar-farm>. [Accessed 18 December 2019].

If you would like to discuss this submission, please do not hesitate to contact myself on ph 0478 218 999 and email [ceo@bze.org.au](mailto:ceo@bze.org.au).

Yours sincerely,



Vanessa Petrie

CEO

[Beyond Zero Emissions](#)

Beyond Zero Emissions acknowledges that we work on Aboriginal land. We pay our respects to their Elders past, present and emerging.

Beyond Zero Emissions gives permission to publicly release this submission.

*Beyond Zero Emissions acknowledge that we mainly work on the land of the Wurundjeri people of the Kulin nation. Beyond Zero Emissions pay their respects to their Elders past, present and future.*