

A General Methodology for Network Integration of Alternatively Fuelled Transit Buses in Regional Cities, and Cairns Case Study

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Public transport buses lend themselves well to electric vehicle (EV) technology as they offer distinct charging advantages due to the fact that their routes are mostly pre-defined and their daily capacity requirement can be pre-determined. They also present an opportunity for power network operators to gain a better understanding of the effects large-scale charging has on the grid in a well-controlled testing environment. Although EV buses are already being trialled in numerous cities, including Sydney Airport's electric shuttle buses, the majority of these trials are in large cities and the benefits EV buses offer to regional cities are largely unknown.

This report uses the results from previously conducted EV bus trials to design a general methodology that allows bus operators to estimate the expected financial and environmental benefits from switching to EV buses. Bus operators are able to input their network specific information to ensure that the analysis conducted generates results that reflect the exact needs of their network. The methodology then calculates the expected additional load charging stations will add to the power network to help determine if potential upgrades will be required. A summary of the methodology is presented in Figure 1.

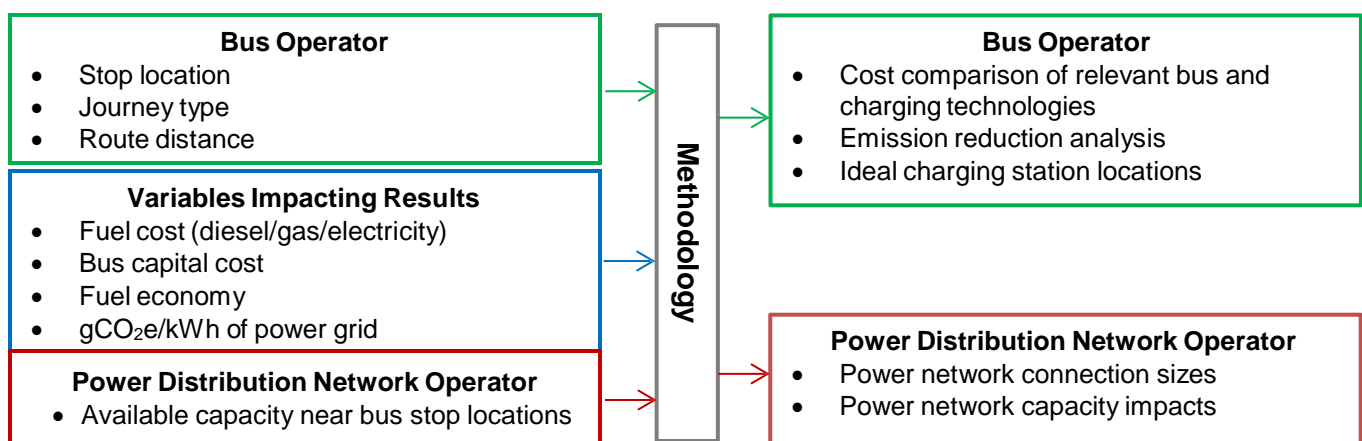


Figure 1: General methodology overview.

Through the conducted sensitivity analysis it was found that the bus operator's financial benefit of switching to EV buses is optimised when the bus network consists of long routes that share several common bus stops. This allows the daily fuel and maintenance savings of EV buses to be maximised while spreading the high capital cost of charging stations across several buses on the network. It was also found that power network operators will benefit from EV buses due to better network utilisation. Power network operators should work closely with the bus operators to ensure peak demand is not exacerbated; for example by devising peak demand management solutions.

The general methodology presented in this report allows bus operators to easily estimate the financial and environmental benefits switching to BEVs offer to their specific network. This will hopefully ignite more interest in the EV area which may also influence passenger EV sales and help Australia move towards its emission reduction target. The report additionally highlights the role power network operators can play in enabling EV technology to ensure mutual benefit is gained by both the vehicle user and the power network operator.

Keywords: Network Integration, Electric Vehicles, Public Transport