



Dedicated to a better Brisbane

Your ref: A564855

24 June 2020

Mr Shane King MP
Chair, Transport and Public Works Committee
Member for Kurwongbah
Parliament House
George Street
BRISBANE QLD 4000
TPWC@parliament.qld.gov.au

Dear Mr King

Thank you for your letter of 8 June 2020 relating to Council's submission to the inquiry into Transport Technology.

Attached is the supplementary information you have requested. For simplicity, Council has replicated the initial table comparing bus fuel types and added diesel buses. We have also provided an update on the current bus fleet and emerging technologies Council is investing in.

If you have any further enquiries regarding this matter, please contact Mr Karl Hain, Manager Engineering and Assets, Transport for Brisbane, on [REDACTED].

Thank you for contacting me.

Yours sincerely

Colin Jensen
CHIEF EXECUTIVE OFFICER

[REDACTED]
Att.

Fuel Types	Hydrogen	Biodiesel	CNG	Hybrid	Electric on-board battery	Diesel
Advantages	No tailpipe emissions	Can be used with current diesel buses	Low carbon emissions	Low carbon emissions Numerous trials around the world	No tailpipe emissions Less noise	High energy density allowing all day operations Cost effective Refuelling time immediate
Disadvantages	Very high purchase cost Fuel source and infrastructure still to be developed Early development stages	Fluctuating fuel cost Fuel source still to be developed commercially	High maintenance and regulatory cost No industry to support ongoing maintenance and operation in Australia	Higher purchase cost Performance uncertainty exists	Electricity charging infrastructure has to be built Battery technology is still a hurdle Electricity generation results in extra emissions Manufacture and disposal of batteries will have an environmental impact	Emissions and pollution Non-renewable energy source Research and development ceased
Initial Cost	\$2,000,000/bus	\$450,000/bus	\$500,000/bus	\$750,000/bus	\$750,000/bus \$150,000/station	\$450,000/bus

Summary of Council Bus Fleet buy Fuel Type – 30 May 2020

Fuel Type	Quantity	Percentage
Compressed Natural Gas (CNG)	326	27%
Diesel	896	73%
Hybrid	1	0%

New and Emerging Public Transport Technologies in Council

Council currently operates a bus fleet of over 1200 buses and replaces approximately 60 buses a year. Since July 2017, Council has committed all new buses will meet Euro VI diesel emission standards or higher. Euro VI emissions standards is higher than the Australian minimum standard of Euro V, however, comes at an approximate cost of \$20,000 per bus. The benefit of Euro VI emissions standard is a 66% reduction in exhaust particulates and an 80% reduction in nitric oxide compared to Euro V standards, contributing to improved air quality. New Euro VI diesel buses are replacing aged Euro III and IV CNG buses. Over the next 8-10 years, all CNG buses will be retired from Council's fleet.

Council is finalising a tender for an electric bus trial. Council is seeking an electric bus solution that charges "overnight" at a bus depot and is capable of completing a full day service on a single charge. A successful tender is expected to be announced in the first quarter of financial year 2020/21. There are three key challenges for electric buses:

- **Balancing Range and Duration** – A number of city route buses do a modest number of kilometres per day, between 180-250km. While a number of electric buses claim to travel this range on a single charge, this is achieved over a short period of time, 3-5 hours. The challenge for city route buses is combining range with running essential on bus systems such as air conditioning for 10-14 hours per day. While there are currently a limited number of electric buses that can achieve this performance, there are more solutions anticipated to be available as battery technology improves.
- **Passenger Capacity** – An electric bus has to balance the requirements between battery charge and passenger capacity. A standard rigid electric bus has a maximum passenger capacity between 60-65 passengers while a diesel rigid has a capacity between 75-78 passengers. To maintain the same passenger carrying capacity across a fleet, approximately 15% more electric buses are required.
- **Electrical Infrastructure** – When electric buses are able to effectively replace diesel buses, there is a requirement for a significant investment in electrical infrastructure to support the charging requirements. By the nature of the bus network, the majority of electric buses need to be charge concurrently overnight while back in the depot. While it is possible to manufacture and replace buses over a relatively short period of time, it could take a decade or more to upgrade the electrical grid to support this requirement.

Council's signature project the Metro, is a biarticulated electric vehicle. Council will be purchasing 60 of these vehicles ready for introduction to service in 2023. The Metro vehicle solution uses a different charging technology. The Metro uses flash charge at

the end of each route. This is achieved through installing having smaller battery packs compared to depot-based “overnight” charging solutions, which increases passenger capacity. This flash charge solution requires a recharge time of approximately 6 minutes at the end of each run. This flash, opportunity charge solution, is suitable for routes that operate point to point on a single route. For efficiency, this style solution has limited application for city route buses as buses are scheduled across multiple routes each day. This form of scheduling is the most efficient way to reduce out of service travel and limit the size of the bus fleet to meet the network requirements.