Submission No 15

EMISSION FREE MODES OF PUBLIC TRANSPORT

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Emission Free Modes of Public Transport

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Executive Summary



Transitioning the New South Wales public transport system to zero emissions has the potential to help transport improve its environmental performance, and deliver a better service for public transport users.

This submission focused on several specific elements that, if implemented, will help lower transport emissions.

The most effective initiative NSW could do to cut transport emissions is reduce overall car use by creating a more usable, efficient public transport system. Mode shifting offers vastly more benefits than switching to zero emission public transport vehicles alone.

Second, accelerate the shift towards a 100% renewable electricity grid.

Finally, electrifying the regional rail and ferry networks offers the most opportunity to decrease public transport emissions. Focusing on passenger rail links that also run freight services offers dual benefits. An electric ferry fleet also offers benefits for local manufacturing and reducing emissions and improving air quality over the Sydney Harbour.

Focus on shifting travel behaviour

Reducing overall car use offers the biggest reductions in transport emissions

Greening the grid

• The effectiveness of transitioning to zero emission public transport requires a zero emission electricity grid.

Green railway and ferry networks

- Set ambitious targets to transition the regional rail and ferry networks to electric.
- Transition targets and local manufacturing commitments will stimulate local green jobs.
- Focus on railway lines that also run rail freight services to maximise opportunities to reduce further transport emissions.

1. Introduction



Figure 1 provides a representation of the emissions intensity and space consumption of different modes of transport. The black balloons represent the emissions intensity of different modes of transport, while the footprints represent the space consumption of the different transport modes.

Figure 1 shows public transport is already very efficient, from both an emissions and space

people that shift from car towards public transport, and then reducing the emissions impact of public transport is the most effective approach NSW can take to lower emissions.

Public transport is already very efficient, from both an emissions and space consumption perspective



Figure 1 Comparison of GHG emissions and physical space requirements for transport modes Nb. These figures are for Victoria. While NSW will have different figures, they will largely be comparable



2. The current NSW public transport system



2.1 Electrification of public transport modes

The current NSW public transport system varies in terms of electrification and emissions production by mode as shown in Table 1.

For the NSW bus fleet, there are currently more than 100 electric buses operating in NSW, with that number expected to reach 200 by mid-2023. The *Zero Emissions Buses Transition Plan* aims to transition 8,000 plus diesel and CNG public transport buses to zero emissions technology. It will see Greater Sydney fully transitioned by 2035, Outer Metropolitan regions by 2040 and regional NSW by 2047.

The NSW light rail/tram network is the only mode of public transport in the state that is currently 100% electrified.

Like buses, the rail network is partially electrified. It delivers electric services across Greater Sydney and in some outer metropolitan regions, otherwise known as the intercity network. Electric railway services operate from Central to Lithgow on the Blue Mountains Line, from Central to Kiama and Port Kembla on the South Coast line and end-toend of the Central Coast and Newcastle line. There are no electric services on the Hunter and Southern Highlands line.

There are currently no committed plans to electrify the public railway network; however, the *Future Energy Action Plan 2020-2025* will see the replacement of the NSW regional rail fleet of XPT, XPLORER and Endeavour trains with a new fleet that will operate in bi-mode configuration. It is expected the new fleet will begin operation in 2023.

NSW ferries currently have no forms of electrification. There are plans to retrofit smaller Sydney Harbour ferries with electric engines by 2025.

Table 1 Electrification of public transport modes

Mode	Electrified	Targets
Bus	Partial	Yes
Tram	Yes	No
Rail	Partial	No
Ferry	One short service	No

2.2 Pairing electrification with mode shift

Commitments to further electrification of public transport modes made by the NSW Government will continue to contribute to the shift towards sustainable transport. However, due to the early stages of electrification of the transport sector in Australia, encouraging the transition from trips completed by car to public transport is crucial for lowering transport emissions and supporting the transition of the transport sector to net zero emissions by 2050. As shown in Figure 1, public transport (that has yet to undergo electrification), is already a greener alternative than trips completed by the car.

encouraging the transition from trips completed by car to public transport is crucial for lowering transport emissions

Figure 2 shows the mode share for journey to work trips completed in Greater Sydney in 2016. It shows nearly 2 in 3 trips are completed by car. The train is the most utilised public transport mode, yet accounts for less than 1 in 5 journey to work trips. Today, this figure is likely lower due to the COVID-19 pandemic which saw public transport patronage in Greater Sydney drop by 41.6% in 2020-21, compared to 2018-19 levels.



Figure 2 2016 Greater Sydney mode share (Journey to Work)

3. International case studies

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This section briefly outlines approaches that other governments have undertaken to support a shift of their public transport to zero emissions. These case studies highlight the opportunity that electrification of public transport can have for the economy and the environment.

3.1 Electrification of the German rail network

The German railway network is one of the largest networks in Europe. As of 2017, the national railway network has 33,590 kilometres of track.

In 2018, 98% of Germany's inter-city passenger rail traffic was handled by electric trains, compared with 92% of freight traffic and 80% of local and regional transport. These values were influenced by huge volumes using the busiest routes, and obscures the fact that the national rail network is only 60% electrified.

Many regional rail services and freight trains are powered by diesel on branch lines. Even on electrified primary lines, some trains are still diesel-hauled under the overhead wires, because other sections of their route have not been electrified.

Although cars and trucks have become cleaner, the substantial growth in demand for transport is wiping out any efficiency gains that are being made. Moreover, many OEM companies have announced plans to close their ICE research and development units, and instead focus on EVs. This means that advances in ICE vehicles is likely to reduce.

3.1.1 Advantages over battery and fuel cell trains

Electrification of railway lines are not the only way to achieve a more sustainable railway system powered by electricity. Trains powered by batteries or fuel cells can also be used as a more sustainable alternative to diesel for non-electrified lines; however, overhead lines have the advantage in energy capacity and efficiency, and infrastructure costs in most instances. Vehicles with battery or fuel cells have an energy storage system, such as a battery or hydrogen tank, that requires vehicle to have adequate carrying capacity. The energy also must be converted several times between storage, resulting in energy loss. Trains with batteries will also require charging and charging infrastructure at depots or stations. This reduces their operational capacity in some instances. As such, overhead lines are usually more favourable and can deliver significantly higher top speeds, particularly for freight or heavy goods trains.

3.1.2 Germany's current rail electrification plan

Germany's current electrification plan, the *Electricity Network Development Plan 2021-2035*, aims to make their traction power 80% electric by 2030 and 100% electric by 2038. These goals align with the sectoral targets set within the German *Climate Action Plan 2050*, where the transport sector is set to contribute a reduction of 40 to 42% in GHG emissions from 1990 levels by 2030.

The German government has provided EUR 5 billion in additional equity to the state-owned German railway company Deutsche Bahn (DB) from the June 2020 economic stimulus package. This contribution was made in order to invest in the modernisation, expansion and electrification of the rail network, and to compensate for the loss of revenue generated from the COVID-19 pandemic. This investment comes in addition to an annual EUR 1 billion until 2030 that was agreed in the *Climate Action Plan 2050* and will benefit rail freight.

These investments, combined with the EUR 84 billion investment from the Federal Government and DB in the new Service Level and Funding Agreement III, will see the replacement and maintenance of rail infrastructure for the next ten years. This investment will see the renewal of around 2,000 kilometres of tracks and 2,000 sets of points. In addition, a total of 2,000 railway bridges will be delivered this decade. New converter stations and improved signal box technology will enable electricity from renewable sources to be fed into the railway power grid.

3.2 New Zealand Ferry Electrification

New Zealand have progressed towards electrifying their ferry fleet. Following Wellington's first electric ferry service making its maiden voyage this year, Auckland are set to receive their first e-ferries in 2024.

These ferries will be 200-seat vessels and have been constructed by local New Zealand boat builders. The first two ferries will be provided at an estimated cost of NZD\$36 million.

This investment in Auckland's ferry fleet comes off the back of a commitment by the city to electrify their ferry fleet by 2040. Analysis by the City found that while ferry trips consist of only 7% of the city's public transport journeys, they accounted for over 20% of the public transport emissions.

Setting clear and ambitious climate targets and applying mode specific targets for transition have created an environment where the local manufacturing industry are able to deliver green infrastructure.

With a similar public transport make up in Sydney, the NSW government could look to Auckland to link improvements to public transport emissions with local manufacturing capabilities. In particular, using the same mechanisms of setting strong targets provides the industry with the certainty required to commit to local, zero emission ferry production.

4. Recommendations



This section provides a concise set of recommendations designed to lower transport emissions in NSW.

4.1 Focus on shifting travel behaviour

- Increase the competitive advantage of public transport over private car use. Do this by increasing the frequency of public transport services.
- Enhance coverage of the public transport network in areas with poor access to services.
- Complete the network of separated bicycle infrastructure connecting to public transport hubs and key destinations.
- Increase population densities around public transport nodes, reducing travel distances and the need to use a car
- Commit to providing dedicated public transport and active transport services with all new and upgraded freeways and arterial roads.
- Integrate new micro-mobility (bike share and scooter share) with the public transport network and ticketing system.
- Provide a fully integrated public transport ticketing system allowing travel across the city on all modes that is flat fare. This encourages longer distance trips to be converted from car to public transport.

4.2 Greening the grid

• Increase investment in renewable energy generation that matches the increased energy demands of a future zero emission public transport fleet.

4.3 Green railway and ferry networks

- Set a target for electrifying the regional railway network.
- Focus on lines that also run freight rail services to facilitate the electrification of those services.
- Update the Sydney's Ferry Future Strategy (2013). Include a transition plan for electrifying the ferry

fleet. Consider the ferry fleet and charging infrastructure required at wharfs.

• Commit to using local manufacturing for electric rail locomotives and ferries to boost local green jobs.

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