

ANALYSIS OF THE ACT LIGHT RAIL PROJECT STAGE 2



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EXECUTIVE SUMMARY

This paper analyses the ACT Light Rail Project Stage 2 to determine whether it, at huge cost (\$1.9 billion and counting), it is the most effective way to achieve the ACT Planning Strategy 2018 for the integration of land use and transport planning to make Canberra a more livable city.

It is based on the analysis by relevant experts on the costs and benefits of light rail vis-à-vis electric buses generally and the ACT Light Rail specifically. **Put succinctly, their overall position is negative.**

The Productivity Commission states it *“will leave it to the (Joint Standing) Committee to ponder the relative attractiveness of light rail when such projects have consistently seen major cost blow outs (see the Sydney light rail project currently underway). Suffice it to say that Government resources are limited and there are many other calls on the public purse that are likely to be more highly valued than the ACT light rail project.*

The ACT Auditor-General states the cost of the next stage of light rail to Commonwealth Park may have been underestimated and the project’s economic benefits overstated. He recommended that the economic analysis be reviewed and updated, including its assumptions and costs and benefits. **He added that this analysis should be made publicly available.**

Light Rail and/or electric buses will not greatly impact on the great dependency on cars that people have as not only do they have to travel to work but they need to drop off/pick up their children at day care centres/schools on their way to and from work.

The current COVID19 pandemic has those emissions from private vehicles (69%) are effectively reduced by working from home. As Professor David Hensher, Founding Director of The Transport Opinion Survey, says *“Beyond the COVID-19 period, we can expect commuting activity to decline by an average of 25 to 30 percent as both employers and employees see value in a work from home plan”.*

The ACT Auditor-General considers that demand for public transport may not be as great in future due to the COVID-19 pandemic changing the way people work, with many continuing to work remotely.

The capital cost of Brisbane Metro network is \$944 million over 21-kilometres of existing busway infrastructure. In comparison, ACT Light Rail Stage Two will be 11 kilometres long (actually, 10.7 Kilometres) at an estimated cost of \$1.9 billion in 2020 figures.

Brisbane Metro is expected to return \$1.91 of benefits for every \$1 spent. ACT Light Rail Stage 2 is expected to return \$0.40 to \$0.60 of benefits for every \$1 spent. However, this includes “Woden Development benefits” which should be disregarded. A more likely BCR is 0.2 as suggested in the Auditor General’s report which would be expected to return \$0.20. The Productivity Commission stated in its submission to the (Joint Standing) Committee that **“The ACT Government’s decision to proceed with a light rail project appears to be an example of where the results of cost-benefit analysis have been ignored without a valid explanation”.**

The ACT Government argument that it’s too late to change is totally incorrect. The actual installation of the light rail infrastructure (wire free tracks, etc.) for Stage2A (to Commonwealth Park) is scheduled to start in 2024. The rest of Stage 2 (Commonwealth Park to Woden TC) is not programmed at all. There are still a number of huge problems to resolve as well as a lengthy approvals process - hence the \$93M design contract to AECOM.

TABLE OF CONTENTS

Introduction

Climate Emergency

Light Rail Already Superseded

Light Rail Not Climate Resilient

Productivity Commission Opposed to ACT Light Rail Stage 2

ACT Audit General - Light Rail Stage 2A Infrastructure Costs Understated

Light Rail Operational Costs Almost Twice Buses

COVID 19 NOT Light Rail/Buses Will Break Canberra Car Dependency

Brisbane Metro Services – A Great Model for ACT

Align ACT Zero Emission Bus Fleet Target with NSW Initiative

Not Too Late to Cancel Light Rail Stage 2

Introduction

The purpose of this paper is to analysis the ACT Light Rail Project Stage 2 to determine whether it, at huge cost (\$1.9 billion and counting) is the most effective way to achieve the ACT Planning Strategy 2018 for the integration of land use and transport planning to make Canberra a more livable city.

It is based on the analysis by relevant experts on the costs and benefits of light rail vis-à-vis electric buses generally and the ACT Light Rail specifically. **Put succinctly, their overall position is negative.**

Climate Emergency

In May 2019, the ACT Government joined many other cities, states and territories around the world in declaring a state of climate emergency.

The ACT Climate Change Strategy 2019-2025 outlines actions to meet the ACT's legislated emissions reduction target of 50–60% (below 1990 levels) by 2025 and establishes a pathway for achieving net zero emissions by 2045, including the move to zero-emission of its 463-bus fleet by 2040.

Transport is the largest source of ACT greenhouse gas emissions now that the Territory is supplied with 100% renewable electricity. It currently accounts for around 60% of the ACT's greenhouse gas emissions. While emissions from transport may decrease in the short-term due to COVID-19 restrictions, transport will remain the ACT's largest source of greenhouse gas emissions and will be a high priority for emissions reduction efforts in coming years.

Most of these emissions are from private vehicles (69%), followed by freight (20%), and public transport such as buses (3%), respectively. Reducing greenhouse gas emissions from transport is a key part of the ACT Government's response to climate change (Source: ACT and Queanbeyan - Palerang Household Travel Survey, 2017 Modelled ACT greenhouse).

Canberrans make 1.3 million trips a day – 1 million by car as driver or passenger, 185,000 walking, 85,000 public transport, 35,000 bicycle and 26,000 other. 25% of Canberrans travel for work on any given weekday. Picking up/dropping off someone (usually to school) makes up a significant proportion of car trip purposes.

Basically, emissions from public transport such as buses (3%) are comparatively small, and it only has the potential to reduce emissions significantly if it can be adapted to attract a significant number of people who currently make 1 million private vehicle trips a day accounting for 69% of these emissions. As outlined below, this could be extremely difficult to achieve.

Light Rail Already Superseded

A 2019 paper by Blaise Kelly puts light rail (trams) ahead of electric buses **AFTER the infrastructure is in place** - [The most energy efficient mode of Public Transport | by Blaise Kelly | Medium](#) - because they are:

- One of the lowest energy costs and most sustainable mass transit systems a city can operate;
- Much lighter than trains, without the need for often cost prohibitive and energy-intensive underground tunnels that a metro system requires;

- Run on hard wheels and rails that can be fully recycled and have much lower rolling resistance than soft rubber tyres; and
- Are plugged directly into the mains, negating the need for energy and resource intensive batteries that need their own separate and often more expensive charging infrastructure

However, this thinking is already superseded by the new technology involving trackless trams as set out in - [What are trackless trams, exactly? \(infrastructuremagazine.com.au\)](http://www.infrastructuremagazine.com.au) – by Peter Newman who (in 2020) says

“New light rail projects had many success stories showing they were able to compete with cars and promote denser development, so commentators like me did our best to make them policy-relevant. I was a big supporter of the Sydney Light Rail when I was the NSW Sustainability Commissioner in 2004-05.

However, I have changed. I think the Sydney Light Rail will be a huge success, but at \$175 million per km and with four years of disruption to the local economy, I cannot see it having much future elsewhere in Australian cities”.

Light Rail Not Climate Resilient

An important point is that Light Rail is not climate resilient.

Trams with overhead wires traditionally run in a built-up environment with buildings tall and close enough to protect the overhead wires. In Canberra this is not the case for the greater part of the line which, particularly along Adelaide Avenue, will run on wide-open avenues.

With the expected increasingly heavy storms, the overhead wires will be quickly damaged. Damage in one location, as also electricity outages, trees fallen across the tracks etc. will paralyze the whole system.

Additionally, Tram lines use up space which should be dedicated emergency lanes to prepare for the predicted extreme weather conditions and, in the interim can be used both by buses and emergency vehicles as well as by private vehicles including taxis with two or more passengers.

In comparison, buses can charge their batteries at different locations, divert in the case of road blockages, be sent out for evacuation, and dedicated bus lanes can be used for emergency vehicles.

As well, turning projected office buildings in Gungahlin into flats and the intensive development along Northbourne Avenue is necessary to justify the high cost of light rail. Actually, the Recall ACT Government paper *Transport for Canberra* – <http://www.cbchristensen.net/papers/2014/12/05/tunnel-vision-light-rail.html> – is not

“just about creating a Frequent Network consisting of high density transport corridors ... it is ultimately about re-engineering all of Canberra...“(T)he ACT Government’s new planning strategy ... outlines an approach to creating a more compact and sustainable city by concentrating new development along transport corridors defined in the Frequent Network.”

At this point, we see that *Transport for Canberra* envisages a truly fundamental transformation of Canberra's urban form in which "(i)ncreased density will help support more efficient public transport as well as vibrant neighborhood centres".

Unfortunately, as well as ignoring ACT Community aspirations and planning principles, this intensive development ignores the IPCC report on heat islands. Such masses of concrete of high-density housing forces people to use air conditioners exuding hot air, producing a vicious cycle.

The Queanbeyan Palerang Council has recently produced a Surface Heat Mapping Report [Keeping it Cool - Vegetation and Heat Adaptation Strategy' - Queanbeyan-Palerang \(nsw.gov.au\)](#).

Sydney suburbs have already reached temperatures of over 50 degrees ([Penrith: Temperatures hit over 50C last summer | news.com.au — Australia's leading news site](#)) with fatal consequences for some. Canberra's 2017 Report urgently needs updating to demonstrate the effect of such high-density developments.

In other parts of the world where the effects of high-density housing have been studied for decades like Japan, the problem is alleviated with satellite towns. This should also be the answer for Canberra, with a railway station in Kingston and inter-office communication increasingly taking place electronically.

Productivity Commission Opposed to ACT Light Rail Stage 2

On 11 July 2018, the Productivity Commission wrote to the Joint Standing Committee on the National Capital and External Territories as follows:

"Dear Committee Secretary

Re: Inquiry into Commonwealth and Parliamentary approvals for the proposed Stage 2 of the Australian Capital Territory light rail project

I wish to draw the Committee's attention to the Productivity Commission's inquiry report into Public Infrastructure (No. 71, 27 May 2014) as it relates to light rail.

In the report, the Commission highlighted the ACT light rail project as an example where the costs of the project were likely to greatly exceed the benefits, and where an alternative public transport project (bus rapid transit) was available that would provide similar benefits at 1/4 of the cost.

As the Commission also noted in the report, for large infrastructure projects, such as this light rail project, project proponents systematically underestimate the costs and overestimate the benefits.

This tendency (optimism bias) has been well highlighted by the UK economist Bent Flyvbjerg who used an extensive database of infrastructure projects throughout the world to reach that conclusion.

Flyvbjerg (2009, p. 353) concluded that "it is not the best projects that get implemented, but the projects that look best on paper".

I will leave it to the Committee to ponder the relative attractiveness of light rail when such projects have consistently seen major cost blow outs (see the Sydney light rail project currently underway).

Suffice it to say that Government resources are limited and there are many other calls on the public purse that are likely to be more highly valued than the ACT light rail project.

On page 94 of the PC report, the Commission stated The ACT Government's decision to proceed with a light rail project appears to be an example of where the results of cost-benefit analysis have been ignored without a valid explanation (box 2.5). This box is attached for the Committee's information.

Paul Lindwall
Commissioner"

ACT Audit General - Light Rail Stage 2A Infrastructure Costs Understated

The recent ACT Auditor-General report states the cost of the next stage of light rail to Commonwealth Park may have been underestimated and the project's economic benefits overstated.

The business case for ACT Light Rail Stage Two states the line will be 11 kilometres long (actually, 10.7 Kilometres) at an estimated cost of \$1.9 billion in 2020 figures - [ACT Light Rail Stage Two - Infrastructure Pipeline](#) – this equates to \$175 million per kilometre.

This estimated cost of \$1.9 billion is also difficult to accept given:

- A. Stage 2A, which extends the line by a mere 1.7 kilometres from Civic in Canberra to Commonwealth Park, includes
 - three light rail stops at City West, City South, and Commonwealth Park
 - expansion of Mitchel depot to stable and maintain additional trams
 - a new bridge over Parkes Way
 - raising London Circuit to the same level as Commonwealth Avenue
 - four new light rail vehicles
 - wire-free track design
 - power supply and transmission, and
 - traffic signaling, road improvements and tree plantings.

- B. Stage 2B which extends the line by nine kilometres from Commonwealth Park to Woden, includes:
 - nine light rail stops
 - a new bridge over Lake Burley Griffin
 - new bridges over intersecting roadways
 - new pedestrian bridges, and
 - wire-free running (no overhead wires) through the Parliamentary Triangle.

ACT Auditor General - Light Rail Stage 2A Economic Benefits Overstated

The recent ACT Auditor-General report states that the economic benefits are most likely overstated.

The audit found that a significant amount of the \$150 million in benefits identified for Light Rail Stage 2A are predicated on the project being a catalyst for the development of the Acton Waterfront, but that neither the Stage 2A Business Case or Economic Appraisal Report provides information or evidence on how it will actually do this.

“Should the Acton Waterfront not be developed as fast as is hoped, then the timing and quantification of the expected benefits of Light Rail Stage 2A are at risk.”

The audit also found the economic appraisal was dependent on a series of ‘transformational projects and revitalisation activities such as the:

- Raising of London Circuit;
- National Capital Authority (NCA) plans to transform Commonwealth Avenue and Kings Avenue into grand boulevards; and
- Development of Section 100, next to the ACT Law Courts.

The failure to implement these projects on a timely basis, two of which are outside the authority of the ACT jurisdiction, would have a negative impact on the expected benefits of Light Rail Stage 2A with significant negative flow on consequences for the ACT Budget bottom line.

The cost benefit analysis results show a benefit cost ratio (BCR) of 0.4 – 0.6 in the Business Case, i.e., for every \$1 of total expenditure, ACT Light Rail Stage 2 expected to return \$0.40 to \$0.60 of benefits to the ACT. However, this includes “Woden Development benefits” which should be disregarded. A more likely BCR is 0.2 as suggested in the Auditor General’s report which would be expected to return \$0.20.

The Auditor General recommended that Major Projects Canberra review and update the economic analysis, including its assumptions and costs and benefits. **He added this analysis should be made publicly available.**

Light Rail Operational Costs Almost Twice Buses

An American study - [Is Bus or Light Rail Cheaper to Operate? \(liveabout.com\)](http://liveabout.com) – shows it is much more expensive, on average, to move one light rail vehicle than to move one bus. It includes a table that shows operating costs per hour for one bus and one light rail vehicle for 15 American cities that have both bus and light rail lines. The data is from the National Transit Database website and it shows that it costs almost twice as much, on average, to move one light rail vehicle per hour versus one bus. The data demonstrates the cost is \$233 per hour for one light rail vehicle versus \$122 per hour for one bus.

The same study also shows that replacing buses with light rail simply adds unnecessary capacity (at huge cost to the taxpayer) because *“replacing a bus operating every 15 minutes with a two-car light rail train operating every 15 minutes is the equivalent of increasing corridor capacity by 300 percent. A two-car light rail train is the equivalent of three standard buses. While ridership is likely to increase due to the introduction of trains, it is unlikely to increase by 300 percent”*.

The American study also demonstrates that, in terms of operating costs, light rail will only be cheaper to operate than buses on routes where there is enough demand to operate buses every two minutes.

Unfortunately, with few exceptions, most cities do not have bus corridors that have sufficient demand to operate buses every two minutes. Instead, cities are choosing to operate their light rail lines as often or more often than existing bus service. Replacing a bus operating every 15 minutes with a two-car light rail train operating every 15 minutes is the equivalent of increasing corridor capacity by 300 percent. While ridership is likely to increase due to the introduction of trains, as stated above, it is unlikely to increase by 300 percent.

The US National Transit Database table shows operating costs per hour for one bus and one light rail vehicle for 15 American cities that have both bus and light rail lines. It shows that it costs almost twice as much, on average, to move one light rail vehicle per hour versus one bus. The data demonstrates that the cost is \$233 per hour for one light rail vehicle versus \$122 per hour for one bus. There is also a much wider range in the cost of operating light rail vehicles (\$124.01 - \$451.33 per hour) than buses (\$84.61 - \$163.96).

COVID 19 NOT Light Rail/Buses Will Break Canberra Car Dependency

Canberra has been car dependent for many decades.

When the Y Plan was developed in the 1960s:

- Growth was to be accommodated in a series of new towns, each with its own town centre containing major retail facilities and substantial office employment.
- These towns were to be linked to each other by a series of peripheral parkways, which reduced the need for traffic to pass through adjacent towns.
- The distinctive structure was designed to satisfy an increasing use of the private car through a comprehensive system of arterial roads, including the peripheral parkways, complemented by the development of an Intertown Public Transport Route.

This dependency became more pronounced in the succeeding decades as:

- Work culture changed from one where employees normally remained with an employer (department) for their working life to one where they more regularly changed employers and work locations.
- Families became increasingly double income units as more women entered the workforce, initially more from an equity perspective but increasingly because of economic reasons, to the extent that double income units are now the norm.
- Single parenting has risen to the extent that these now account for approximately a quarter of all family units.

These changes have created a great dependency on cars as people not only have to travel to work but need to drop off/pick up their children at day care centres/schools on their way to and from work.

In parallel, Canberrans, until the 1990s overwhelmingly preferred low-density dwellings and there was limited demand for higher density housing even in areas of high accessibility including Civic and the town centres. In fact, it was necessary on occasion, to convert sites identified for higher density to lower density housing.

As well, the 1990s policy that Commonwealth offices were directed to locations facilitating the town centre policies of the NCDC was cancelled and office location decisions were decentralized to individual departments. This contributed to the failure to establish major office employment in Gungahlin which, in turn, partly justified the Light Rail Stage 1. It also facilitated the car dependent office development at the Airport and greater office development in other areas including Civic and Barton leading to increased traffic congestion and need for additional road infrastructure.

The current ACT Government has endeavored to address this situation by encouraging the building of higher density near mass transit routes and reduce the supply of lower density housing blocks. However, the constraining of detached housing supply in the ACT did not diminish demand but simply contributed to huge house price increases and greater car dependent developments in the region. Also, as stated above such masses of concrete high-density housing create extensive heat islands which force people to use air conditioners exuding hot air, producing a vicious cycle.

The current COVID19 pandemic has demonstrated a most effective way to reduce emissions from private vehicles (69%) is working from home utilising modern technology to communicate with work colleagues and clients.

The Transport Opinion Survey, conducted by the University of Sydney Business School's internationally respected [Institute of Transport and Logistics Studies](#) (ITLS), found that across all industries, one in five employees worked from home regularly before the pandemic.

Three in four workers believe that post-COVID-19, their employers are more likely to support work from home than they did before the pandemic. During the pandemic, the number of work from home days doubled for managers and almost tripled for employees in sales and clerical/administration work.

"The evidence reinforces the fact that as we move through and beyond the COVID-19 period, we can expect commuting activity to decline by an average of 25 to 30 percent as both employers and employees see value in a work from home plan," said [Professor David Hensher](#), Founding Director of ITLS.

The recent ACT Auditor-General report states that the demand for public transport in Canberra may not be the same in the future due to the COVID-19 pandemic changing the way people work, with many to continue working remotely.

If Professor Hensher and the ACT Auditor General are correct, this is a more effective way to achieve The ACT Climate Change Strategy 2019-2025 as it would reduce this would significantly reduce the 1 million trips a day by private vehicles and, as emissions from private vehicles account for 69% of ACT greenhouse gas emissions.

Post Covid, public transport - be it by tram or bus - will likely remain unattractive with high infection rates and the significant increase in the use of electric bicycles and scooters will continue to climb. The Brisbane City Council has recognised this and is investing heavily in "bikeway and pathway projects" [Bikeway and pathway projects | Brisbane City Council](#). The ACT Government should do likewise.

Brisbane Metro Services – A Great Model for ACT

In 2016 the Brisbane City Council, through a detailed options assessment process, identified a network of high-frequency, high-capacity metro services over 21-kilometres of existing busway infrastructure as the preferred solution to improve the way people travel to and within Brisbane, supporting future population and economic growth across the region.

The Business Case for Brisbane Metro assessed the benefits, impacts and costs of delivering the expanded project. It confirmed Brisbane Metro as a cost-effective solution that unlocks the potential of the existing busway infrastructure and lays the foundation for future growth through five key elements:

1. Existing, new and upgraded infrastructure;
2. High-frequency, 'turn up and go' metro services and a revised bus network;
3. A new fleet of high-capacity metro vehicles;
4. Policy and operational improvements; and
5. Passenger and vehicle management systems.

The Business Case established that, by combining these elements, Brisbane Metro would deliver considerably greater benefits than any single solution to addressing Brisbane's bus capacity and congestion issues:

Brisbane Metro will consist of a new fleet of 60 high-capacity Brisbane Metro vehicles, each able to carry up to 150 passengers. Each vehicle will be approximately 24 metres in length, with up to three passenger compartment sections. Potential features of the vehicles include: four double-leaf access doors; four axles / 12 wheels; low floor entrance; capability to comfortably travel along gradients of up to 10%; Wi-Fi access and charging facilities; and energy efficient and low-emission operations.

On a conservative basis, the cost benefit analysis results show a benefit cost ratio (BCR) of 1.91, i.e., for every \$1 of total expenditure, Brisbane Metro is expected to return \$1.91 of benefits to the Brisbane region.

Cost estimates for the project indicated the total capital cost to deliver Brisbane Metro is \$944 million over 21 kilometres of existing infrastructure.

In comparison, the business case for ACT Light Rail Stage Two states the line will be 11 kilometres long (actually, 10.7 Kilometres) at an estimated cost of \$1.9 billion in 2020 figures – this equates to \$175 million per kilometre.

Align ACT Zero Emission Bus Fleet Target with NSW Initiative

As at January 2021, ACTION's route service fleet consisted of 463 buses. This means it has to convert just 20 buses a year to have the fleet fully electrified by 2040. This compares with the 889 buses annually that the NSW Government will electrify in line with its "plans to have all its 8,000 buses electrified by 2030 in line with its net zero by 2050 plan".

As part of its 2021 rollout, the NSW already has 50 Australian built buses by Customs Denning in St Mary's in Sydney with a further 70 electric buses on order from Truegreen's Nexport, which is setting up a manufacturing facility in the Southern Highlands.

The locally manufactured Element e-buses can run for approximately 16 hours on a full charge or 450 kilometres. The trial bus runs between Bondi Beach and Bronte and is free for passengers during the trial.

Transport Minister Andrew Constance said. *“The State’s first trial of a locally built electric bus takes us closer to an emissions free future and supports hundreds of local jobs, which is an amazing outcome for NSW.”*

The Parliamentary Secretary to the Premier and member for Vaucluse, Gabrielle Upton said, the trial had obvious benefits for the environment, *“Our Government is getting closer to securing a cleaner, healthier future for the people of NSW and it’s very exciting that the first of these locally-made electric buses are being trialed in my electorate. Charging infrastructure will be installed soon at the Waverley Bus Depot, which will help future bus operators in the Eastern Suburbs plug into the electric revolution.”*

The manufacturer of the Element e-bus, Custom Denning, welcomed the trial and government support, with Managing Director Scott Dunn saying, *“The NSW Government has supported our business since I purchased it three years ago, now we can help them build a better future for both commuters and the environment. Being able to rebuild the business from our St Mary’s factory has allowed us to employ more than 200 locals and keep skilled manufacturing jobs in Australia.”*

Not Too Late to Cancel Light Rail Stage 2

The ACT Government argument that it’s too late to change because it has not only already committed to Stage 2 but has already started the project is totally incorrect.

As has been previously pointed out, the actual installation of the light rail infrastructure (wire free tracks, etc.) for Stage2A (to Commonwealth Park) is scheduled to start in 2024, after the extraordinarily messy and disruptive work to raise London Circuit is complete.

The rest of stage 2 (Commonwealth Park to Woden TC) is not programmed at all.

There are still a number of huge problems to resolve as well as a lengthy approvals process - hence the \$93M design contract to AECOM.

Additionally, the required Environmental Impact Statement has to include a more rigorous economic analysis that must, in turn, include a detailed evaluation of ‘feasible alternatives’ such as has been canvassed in this paper, and by the time that happens (on the basis of a lot of future design work) those considerations may well become overwhelming.

If the ACT Government finally abandons Stage 2, hopefully without letting further contracts, it will be open to criticism for wasting money on unnecessary design work, but could be able to save most of the projected cost.