The Sharing Solution

Modelling an autonomous electric fleet shows there is one key to reducing transport cost and congestion: sharing rides in peak periods

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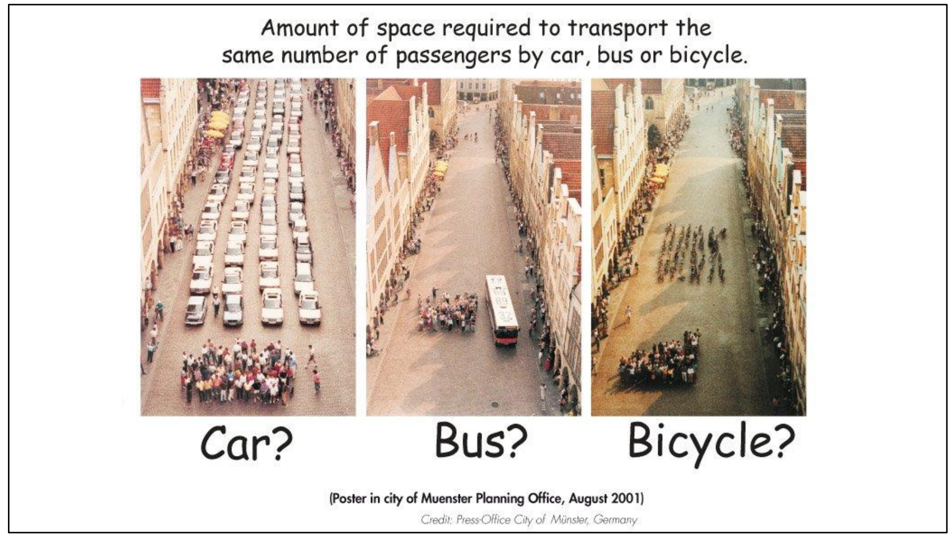
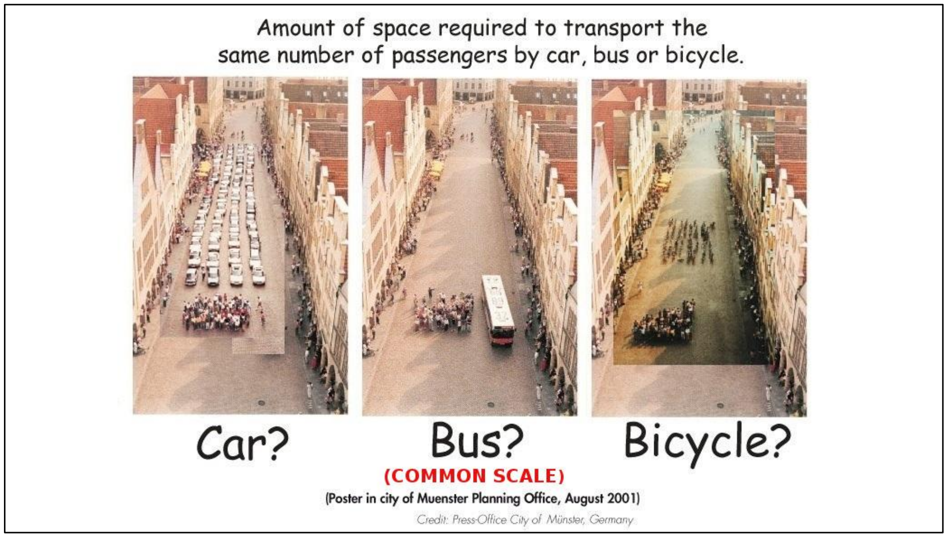
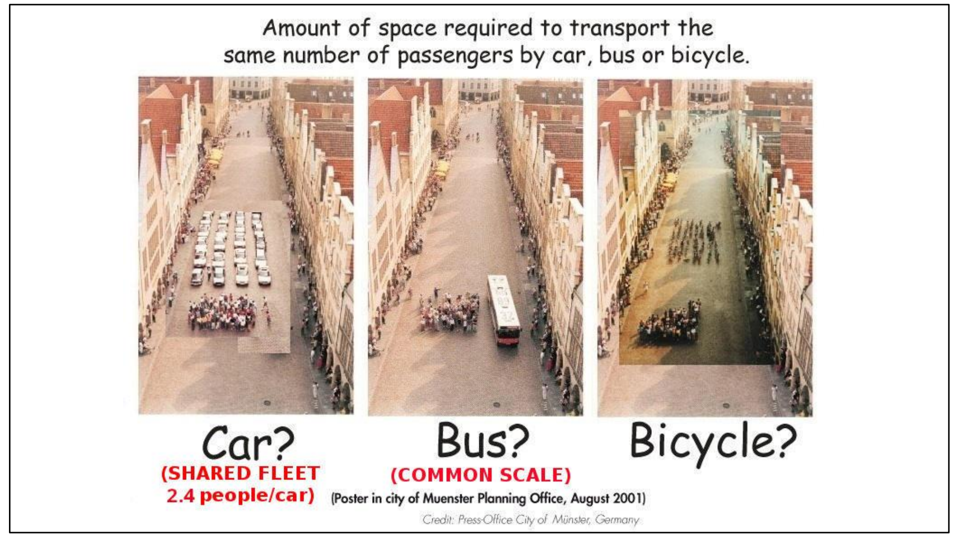
Spoiler up front, lede not buried



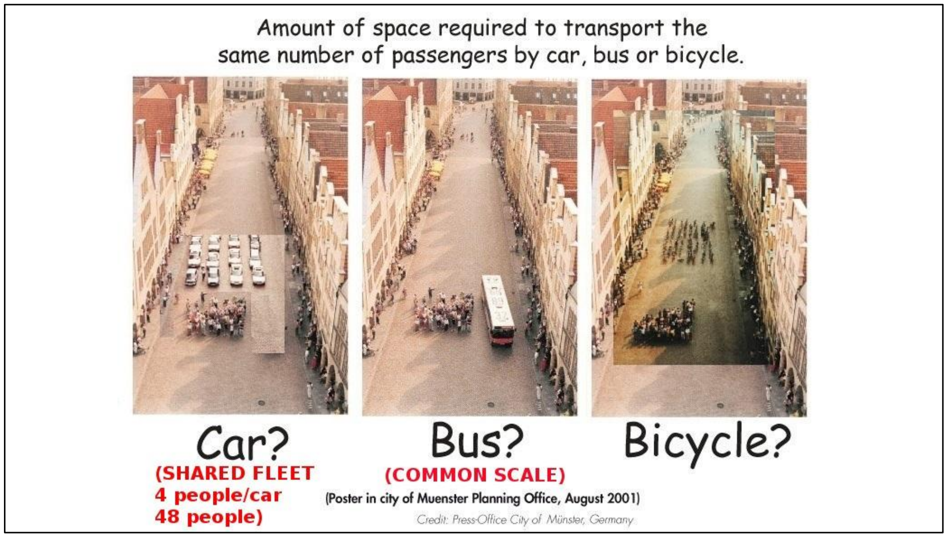
A popular meme from the time-before-memes, 2001.
Notice something about the street on the left with the cars?
That image has been rescaled for dramatic effect, and yes, like many memes, accuracy and good faith comes second to drama and provocation, but nevertheless, it presents a compelling idea that cars CAN be a very space-inefficient way of moving MANY people on highly trafficked routes.



What a more honest representation would look like. It still looks damning for cars - moving 48 people in 48 cars takes up a crazy amount of space compared to a bus or 48 bicycles (not that bikes would ever travel as closely as represented here).



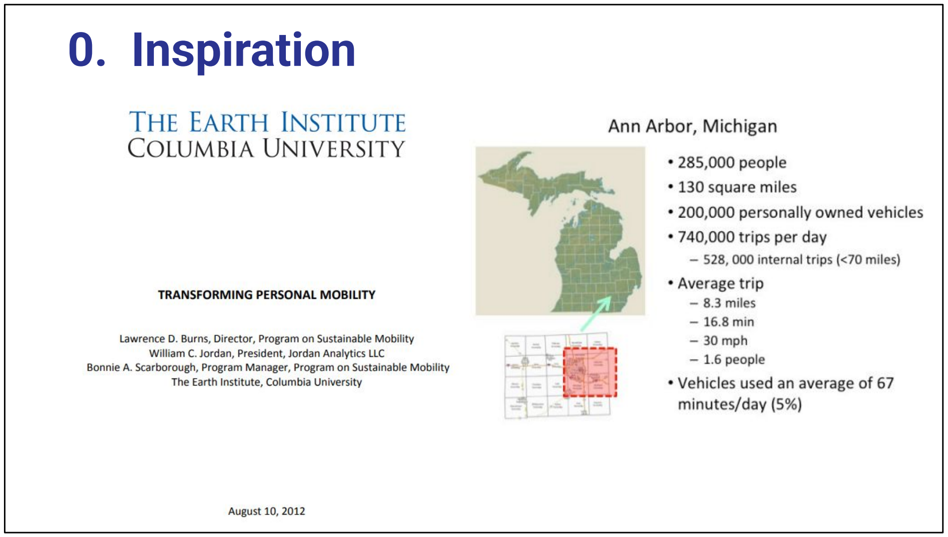
But what about if we can conveniently put 48 people in 20 cars. Is that possible without losing the door-to-door, 24x7 convenience of a car? As we'll see, yes it is.

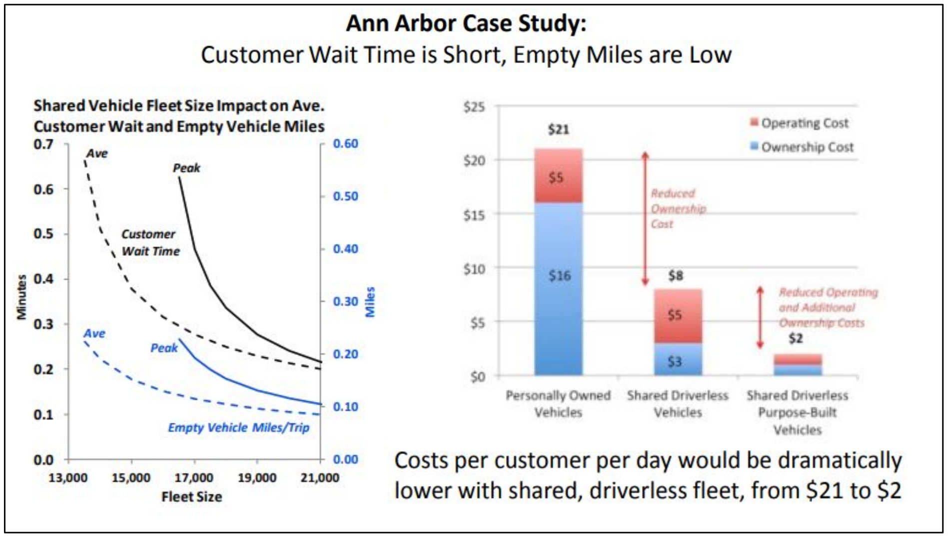


Topics

1. Implications of private autonomous EVs for transport congestion
2. Advantages of a shared fleet of autonomous EVs
3. Transport patterns in Canberra
4. Findings of a simulation of a shared fleet of autonomous EVs in Canberra

And if you can routinely fit 4 people per car on the most congested routes, the space required is even further reduced.





But first, a quick but heartfelt acknowledgement to the inspirations of this work. This study, "Transforming Personal Mobility", published 13 years ago, looked at the feasibility of on-demand, door-to-door ride sharing service of autonomous vehicles in variously sized cities in the US, one of which was Ann Arbor, slightly smaller and denser than Canberra but not that dissimilar.

The results were so astounding as to seem ridiculous - that graph on the left shows that as fleet size increases and use of the service increases, wait times decrease to ludicrous levels. With an autonomous fleet size of just 10% of the private car fleet, there is no waiting, even in peak periods. And the costs per journey fall dramatically. Surely if this was true, AND autonomous vehicles eventually arrive, won't this be how public transport evolves? But there's never just one inspiration. The other was Warwick Cathro whose curiosity, collaboration and encouragement led to an attempt to replicate these results in Canberra.

1. Implications of private autonomous EVs for transport congestion

EVs are better than ICE cars

- **Better performing, no tailpipe emissions, simpler to make**
- **Cheaper to use** → ***increased use***

Autonomous EVs are better than EVs

- **Safer**
- **Usable by more people** → ***increased use***
- **Allow repurposing of travel-time** → ***increased use***
- **Transport goods *and* people** → ***increased use***

No-one here needs to be convinced that EVs are better & cheaper cars. Just as better & cheaper chocolate encourages consumption, better cars encourage travelling.

Autonomous EVs are better still.

1300 people died in road deaths in Australia last year. 36,000 people were hospitalised due to a road accident. As the journalist Derek Thompson has noted, if we suddenly found a drug preventing a disease that killed and hospitalised that many Australians each year, it would be hailed as a "miracle drug" - autonomous cars are that miracle drug for road accidents.
But not just safer - they are usable by more people AND allow those people to repurpose their travel time whilst retaining the advantages of door-to-door and 24x7 travel, AND can be used for moving goods around too.

AEVs will increase demand for travel, and the cost of the increased congestion will matter less to their users but be borne by society at large - a classic negative externality that will rightly be resented and fought.

https://www.bitre.gov.au/sites/default/files/documents/road-trauma-australia-2024.pdf

2. Advantages of a shared fleet of autonomous EVs

- ***Much* Cheaper**
  - **Better use of capital and space**
    - **most private cars are 95%+ idle and occupy valuable real-estate**
  - **Efficiencies of scale for charging, maintenance**

- **Reduced congestion**
  - **If journeys are shared in peak periods, *far fewer* cars are needed**
    - **...which further reduces capital requirements and further reduces costs**

But if AEVs are operated as a shared fleet, and in particular journeys are shared in periods where road space is congested, this increased use is all upside - as a society we get the benefits of increased mobility without the costs of congestion or pollution, and at an even cheaper cost per journey.

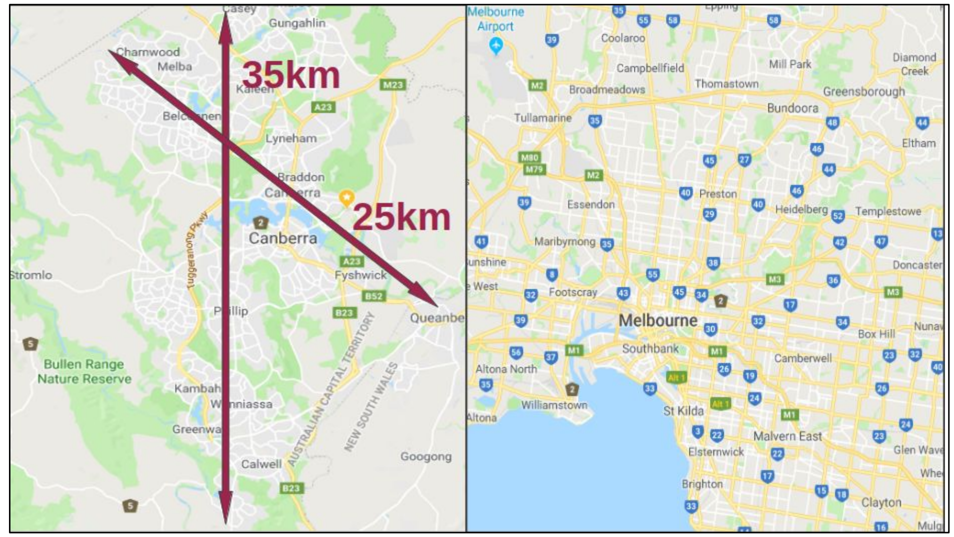
The capital cost of a privately owned car is amortized over relatively few journeys. Most private cars sit idle at least 95% of the time, incurring capital holding costs and occupying space that is excluded from productive use, whether it be a garage that could be another habitable space or a parking lot that could be parkland or housing or an income-generating business.

When operated as a fleet, efficiencies of scale further reduce costs.

But the focus of this talk is how congestion is greatly reduced, which is a step in a virtuous cycle of increasing mobility which increases fleet utilisation which further reduces costs. That's the main "takeaway" from this talk: shared journeys reduce costs which increases the value of mobility which increases sharing and so on.

3. Transport patterns in Canberra

- **Large area, small population, good road network**
- **Stronger "tidal" flows as employment has concentrated**
- **But public transport struggles to support far-flung suburbs and many smaller employment hubs**



Canberra, like Ann Arbor, is atypical of most cities - large area, small population, good road network.

One of Canberra's planning tenets was that employment was not just centrally clustered but was distributed to the town centres. This started to break down in the 1990s and has been effectively abandoned - the newest town areas of Gungahlin and Molonglo are comparatively negligible employment hubs and employment in the city, parliamentary triangle and a new non-residential area near the airport has increased.

Flows are more "tidal" than ever - out of the suburbs in the morning towards employment hubs then back out to the suburbs in the evening. As Canberra has expanded, the population has grown and the public transport network hasn't kept up. Many non-central areas of employment and far-flung residential areas are poorly served, so much so that travelling around by car is effectively mandatory for many people.

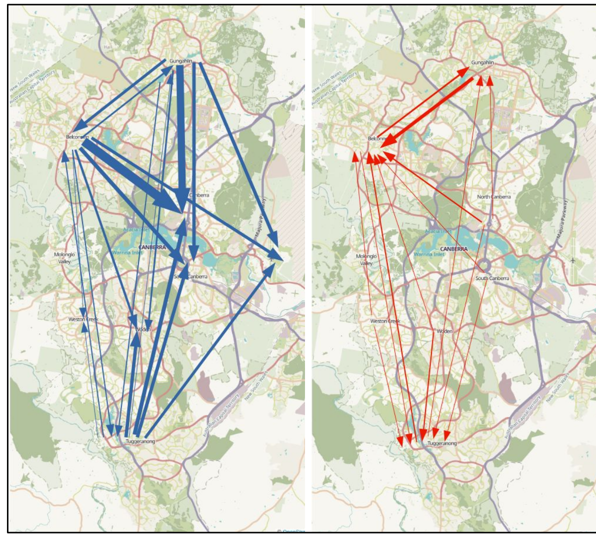
Canberra's footprint may be surprisingly large.

Journeys to work are *tidal*

Start Locations	Gungahlin	Belconnen	North Canberra	Airport	Molonglo	South Canberra	Woden	Weston Creek	Tuggeranong	Total
Gungahlin	9964	5657	12985	5836	115	6015	2813	375	2027	45787
Belconnen	3277	15852	14267	4995	216	7133	3521	499	2072	51832
North Canberra	1048	2241	16934	4537	31	6199	1738	252	757	33737
Airport	7	4	35	94		38	21	5	26	230
Molonglo	218	568	1557	651	406	1143	1045	209	632	6429
South Canberra	256	626	4280	2135	22	7011	1294	164	589	16377
Woden	346	966	4179	1843	58	4007	5607	434	1646	19086
Weston Creek	263	678	2573	1088	53	2129	1668	1480	919	10851
Tuggeranong	1132	2029	7300	5271	100	6478	6098	830	13169	42407
Total	16511	28621	64110	26450	1001	40153	23805	4248	21837	226736

Source: ABS 2021 Census

The figures in this chart from ABS 2021 Census "journey to work" are too hard to read, but if you squint you'll perceive some columns have much bluer backgrounds than others. These columns represent the places which people travel to work "to", So, starting locations are in the left most column. North Canberra and South Canberra attract the most workers, but the Belconnen, Airport get a few, followed by Woden and Tuggeranong.



Journeys **To** Work

From Belconnen, Gungahlin and Tuggeranong (Blue)

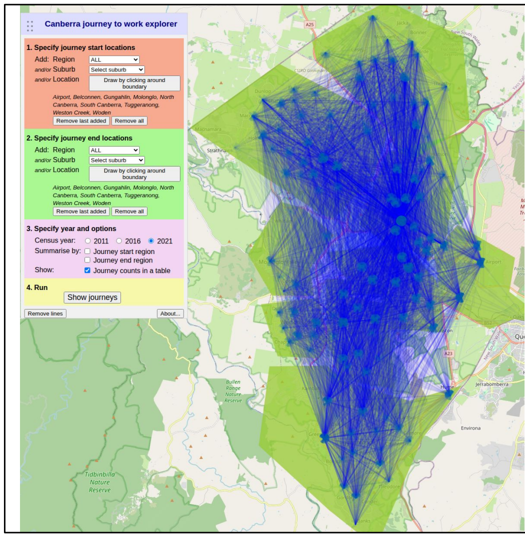
To Belconnen, Gungahlin and Tuggeranong (Red)

Fewer than 500 journeys not shown.

Source: ABS 2021 Census

The map of the left represents a subset of that data, showing where people in Belconnen (to the west), Gungahlin (to the north) and Tuggers (to the south) travel. Journeys within those regions are not shown for clarity, and these lines represent inter-region volumes. The map on the right shows journeys travelling to Belco, Gungahlin and Tuggers - you can see there are far fewer journeys into these places, as you'd expect from tidal flows.

Surely such asymmetric flows are the death of an efficient large scale sharing system - imagine if taxis had to manage these flows - there would be few fares going in one direction, causing fares in the "productive" direction to be much higher than they would otherwise be?



Journeys **To** Work

ABS Statistical Level 2 (SA2)

Source: ABS 2021 Census

This is the data at the "Statistical Level 2" , or roughly "suburb" granularity. The messy reality is that although there are journey to work "hubs", there are lots of destinations that matter if you want to provide a useful transport service. And this is just journeys to WORK.

Tidal but "diffuse"

- **Less than half of journeys to work end in one of the major centres of the town centres (Belconnen/Gungahlin/Phillip/Greenway/Weston) or central area employment "hot spots" (Civic/Acton/Russell/Barton/Parkes South).**
- **More people travel**
  - **to Fyshwick than Barton**
  - **to Garran than Acton or even the Parliamentary Triangle**
  - **to the Kingston/Griffith area than Russell**

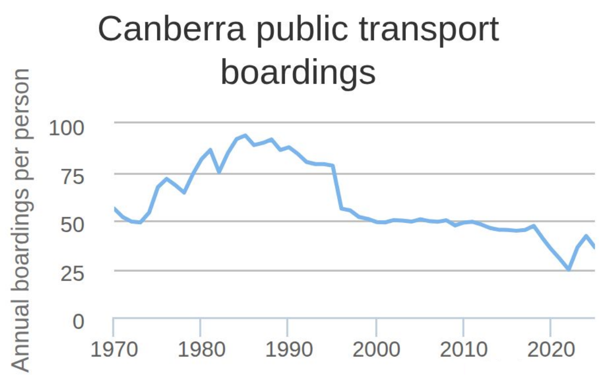
  About the same number travel to the Airport/Majura area as Acton and Russell combined.
- **Public transport to these *off-piste* areas is relatively inconvenient.**

So "Tidal but diffuse" may be a better characterisation.

Indeed less than half of journey- to-work end in one of the major town centres or employment hot spots.

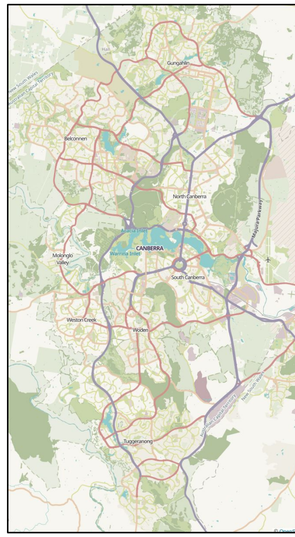
More people travel to…

And all journey destinations are even more diffuse than the work journeys represented here. The cost of providing adequate public transport from everywhere to everywhere is so high it hasn't been done, hence the car dependency.



Source: Paul Mees: "Fifty years of public transport planning in Canberra"
Extended with post 2014 data from ABS and Transport Canberra

Public transport is Canberra has a fascinating history which I don't have time to go into, but if one graph can summarize its decline and fall it is this. If you are interested in the details, I commend Paul Mees writings.



4. Findings of a simulation of a shared fleet of autonomous EVs in Canberra

So, what happened when we modelled how shared AEVs could be used in Canberra?

Service requirements

1.1 million weekday journeys

Convenience

- **Door-to-Door**
- **24x7**
- **On demand (no booking)**
  - **95% within 1 minute**
  - **99% within 3 minutes**
- **No slower, end-to-end, than private car**

Cost

- **Cheaper than private car**

We started with similar requirements of the Columbia work - could such a service replace most of the private and public transport in Canberra? Not tradies-utes, not cement trucks or delivery vans, but everything else. For Canberra, that's about 1.1 million journeys each weekday.

To be viable, it would have to be at least as as convenient as a private car, approaching the convenience of an AEV that you don't need to bother parking, but provides door to door service, 24 x 7, with no pre-planning, no waiting. You just summon a car on your mobile, and by the time you've put on your hat, it's waiting by your letterbox.

And to further persuade the owner/driver, if efficiency and minimising externalities and the public good aren't enough, it has to be cheaper - much cheaper - than bothering with your own car. You'll actively *want* to repurpose your garage into a games room, or wine cellar or self-contained flat.

Base Model Vehicle

Cost: **$65,000**

Spares: **Additional 5%**

Life: **3 years**
Average residual value: $14,000

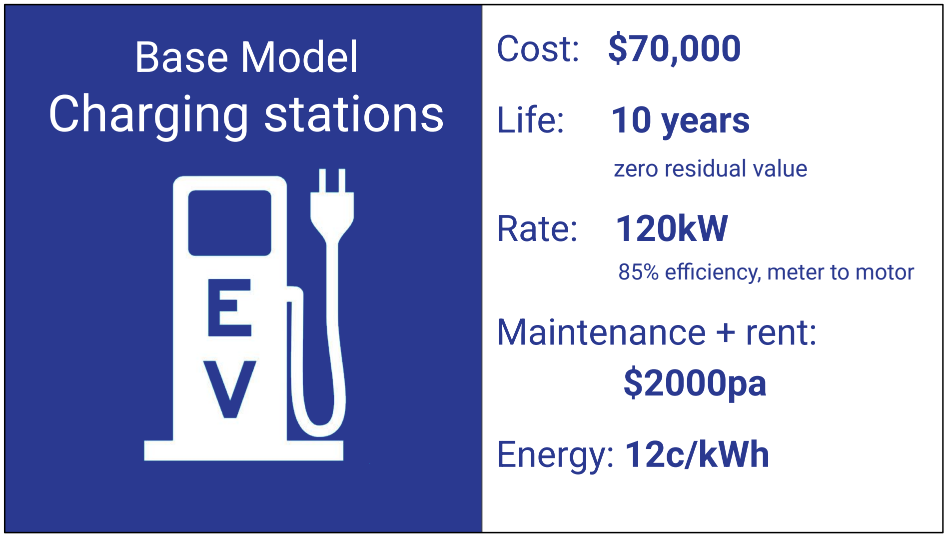
Range: **410 km usable**
But operated between 25% and 80% of range

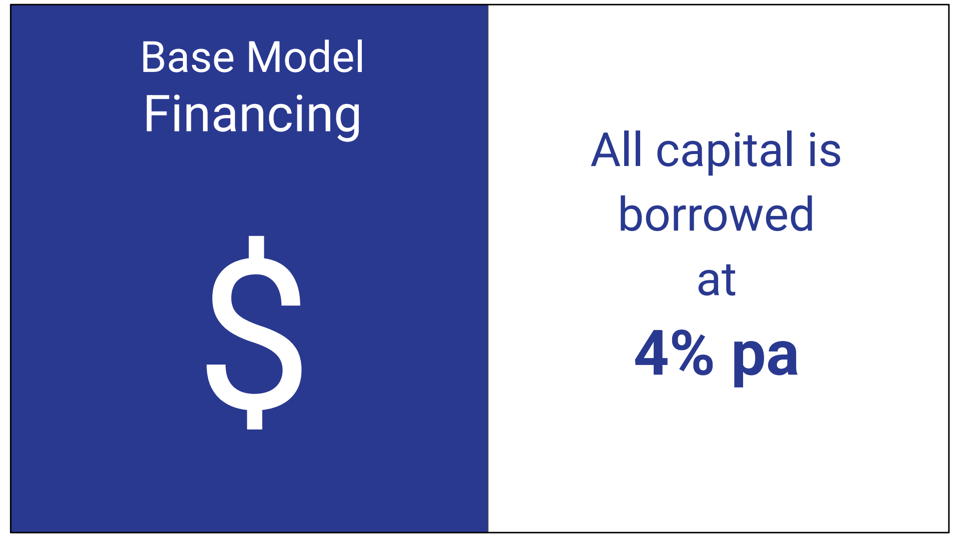
Maintenance + cleaning:
$4000pa + 6c/km

Efficiency: **140 Wh/km**

The vehicles in the simulation have reasonable yet conservative default characteristics you can change yourself when you run the model:....

(that's an implied 60 KWh battery, 22% residual value)





It also has default assumptions for the charging infrastructure: …
12c per kWh may strike some of you as low, but currently it is a feasible average "all up" commercial price for a large power consumer to pay for electricity and network costs.

As for how the fleet is financed…

As of Oct 30 2025:

- Yield on 3 year Australian Government Bond: 3.6%
- Yield on 5 year Australian Government Bond: 3.8%
- Yield on 10 year Australian Government Bond: 4.3%

The 3 year rate could be pertinent to a government operator of the fleet (car finance is 3 years, finance of chargers at 10 years is negligible in comparison)

Service outcome to meet requirements

1.1 million weekday journeys

- **Cars**
  34,000 (+ 5% spares)
- **Charging Stations**
  1,200
- **Energy**
  2.1GWh per weekday
- **Workforce**
  2785 people

Base Model Workforce

2785 Full-time-equivalent (FTE): $215M pa

Cleaning and charging:
2.8m hr/yr requires
1900 FTE @ $40/hr: $122m/yr

Mechanics/electricians:
0.9m hr/yr requires
600 FTE @ $100K/yr: $60m/yr

Admin/management:
220 FTE @ $110K/yr: $24m/yr

Senior management/technical specialists
69 FTE @ 130K/yr: $10m

It turns out that to run a fleet with those characteristics that provides 1.1 million journeys each weekday, you only need 34,000 cars (plus 1,700 spares) and 1200 charging stations. The fleet will consume just over 2 GWh per day and needs 2785 full time employees to manage.

(BITRE - 278K passenger cars registered in ACT in 2024, 338K all vehicles).

The model describes the requirements for cleaning and maintaining a fleet of this size in detail, but the headline figure is a workforce of about 2800 people, around 70% of whom are required for cleaning and charging.

Base Model Tariffs

Peak **40c flagfall + 40c/km (ex GST)**
Weekdays 7am - 9am, 3pm - 6pm
Typical 11km journey costs $5.28 (inc GST)

Off Peak **30c flagfall + 25c/km (ex GST)**
Typical 11km journey costs $3.36 (inc GST)

Sharing Weekdays between 6am - 10am and 3pm - 7pm

To pay for all this and generate a reasonable return, these tariffs are required.
A typical peak period commuter journey will cost the commuter $5.28. The same journey out of peak period will cost $3.36.

As we will see, these costs are tiny compared to the alternatives of public transport or private car ownership.

But they only work because of 1 thing: sharing of vehicles in periods of high demand. And sharing only works when there is a sufficient pool of people wanting to travel at the same time from a set of nearby addresses (think of the same suburb) to a set of nearby destinations (within a km or two of each other).

During the sharing period, you effectively book 1 seat in a car. Outside that period, you are booking an entire car.

Cost comparison

	Public Transport (From ACT 2024-25 budget)			Private Car		Shared Fleet AEV
	Fare	Subsidy	**Actual Cost**	Excluding parking	**Including parking**	**Including 10% GST**
Daily commute 24km round-trip (parking in the Parliamentary Triangle)	$6.64	$39.96	**$46.60**	$24.00	**$41.50**	**$11.44**
Night out in Civic, 2 people travelling together, 24km round-trip	$10.52	$82.68	**$93.20**	$24.00	**$23.00**	**$7.26**
Weekend family trip to Belconnen Mall, 2 adults, 2 children, 20km round-trip	$17.16	$169.24	**$186.40**	$20.00	**$20.00**	**$6.16**

1. Actual costs are based on Transport Canberra's estimated 2024-25 outcome in the 2025-26 Budget Statement and the assumption that on average 1.3 boardings on average being required to complete a one-way journey: 17.3 million boardings results in roughly 13.3 million journeys. Transport Canberra's revenue (assumed mostly to be fares) was $15m, expenses were $310m, resulting in an average journey *actual cost* of about $23.30. The *Actual Cost* column includes the Transport Canberra subsidies averaged over all trips.
2. Based on the RACV Car Running Costs Survey 2023 for the cheapest-to-run (and high selling) medium SUV, Toyota RAV4 GXL 2.0 FWD CVT: based on 15,000 km travelled per year averaged over first 5 years of ownership, but not including parking, garaging, cleaning, the cost of driving is $1.00/km.
3. Based on default simulation parameters and including GST

Base Model Income and Expenditure ($M/pa)

Fare Income (ex GST) **$1282**

Expenses

Capital + Interest	$ 674	
Workforce	$ 215	
Insurance, rego, comms, workshop	$ 104	
Tyres, parts, consumables	$ 90	
Electricity	$ 87	
Other	$ 8	
Total		**$1178**

Surplus **$ 104**

The default model generates a surplus of about $100M pa.
The main expense is capital repayments and interest (53%) followed by salary & super (17%).
Power is only 7%.

[There are more than enough fare income GST credits to apply to offset parts, insurance and electricity GST, but ignored here]

Financial summary *per vehicle*, averaged over weekday and non-weekdays

Revenue **$**

Fares **103.30**

Expenses **$**

Capital & interest (incl charger cap/intr & maint/rent)	54.46
Power	7.01
Rego/insurance/comms/workshop/ tyres/parts/consumables/misc	16.13
Workforce	17.32
Total	**94.92**

	Fares	Total km
Av Day	30	336
Year	10,800	122K

Daily surplus: $8.38 per vehicle

Annual surplus: **~$3060** per vehicle
~$104M for the fleet

Perhaps a more intuitive way of looking at this is to look at income and expense at a per car, per day level.

On a typical day, averaged over week and weekends, each car takes 30 fares and travels in total (including between passenger trips) 336km, and earns a surplus of just over $8

Base Model
Results from a typical simulation run (Weekday)

- 1,101,515 journeys
  - Peak: 523,701 (47.5%)
  - Offpeak: 577,814 (52.5%)
  - Average length: 10.6km
- Passengers per journey leg:
  - 1 person 79.7%
  - 2 people 10.3%
  - 3 people 4.1%
  - 4 people 5.9%

The fleet must be sized to cope with the peak - the sharper the peak, the more cars required. Almost 80% of the time, the person booking the car will be the sole occupant.

It is possible that some people may want a car to themselves during the time of day that a car could be shared. They could book a car for 4 passengers and pay 4 full fares to accomplish this.

Base Model
Results from a typical simulation run (Weekday)

Wait distribution:

Wait time, minutes	% of journeys
<= 1	95.8
1 - 2	3.2
2 - 3	0.6
3 - 4	0.3
4 - 5	0.1
5 - 10	0.06
> 10	0

Maximum wait: 9 minutes

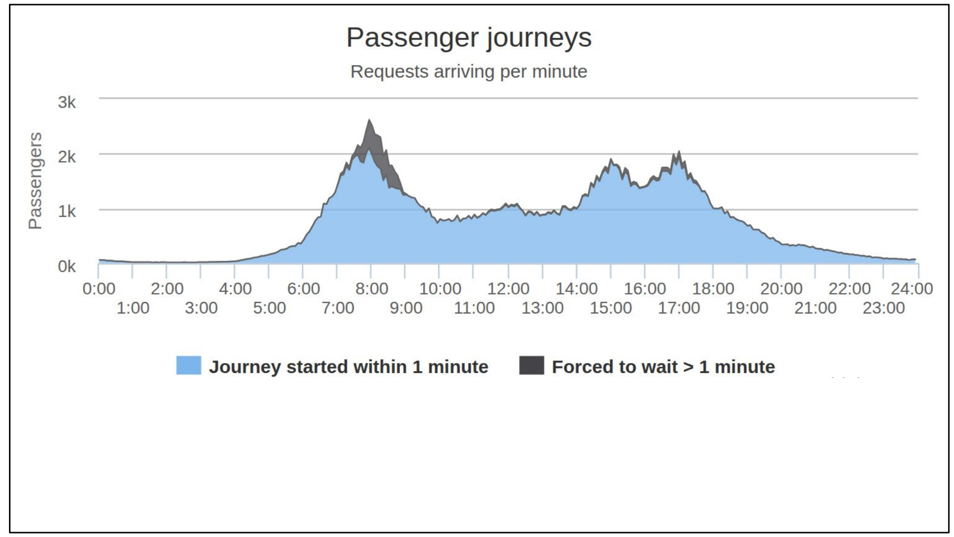
Wait times are low. An intuitive way to think about this: Canberra has about 120 "suburbs". The average area of a suburb is around 2.5 sq km.

Even at the busiest minute in a typical simulation, there are over 2,500 cars idle - not carrying passengers, not transferring in anticipation, but stopped and with no plans - just waiting in anticipation at locations **predicted** to minimise network-wide waiting times. That's on average around 21 idle cars per "average suburb" even at the time of peak demand, so there's likely one within a max radius of just 200m from you - in your street or the next street. And at 30km/hr, even 500m road distance is just 1 minute away. There are even more cars idle but transferring within your suburb, or currently picking up a passenger or just starting a journey near you who is travelling to a destination near or on the route to yours that could also be assigned to your journey during shared-journey periods.

The fleet is sized to maintain this level of idleness and hence performance.

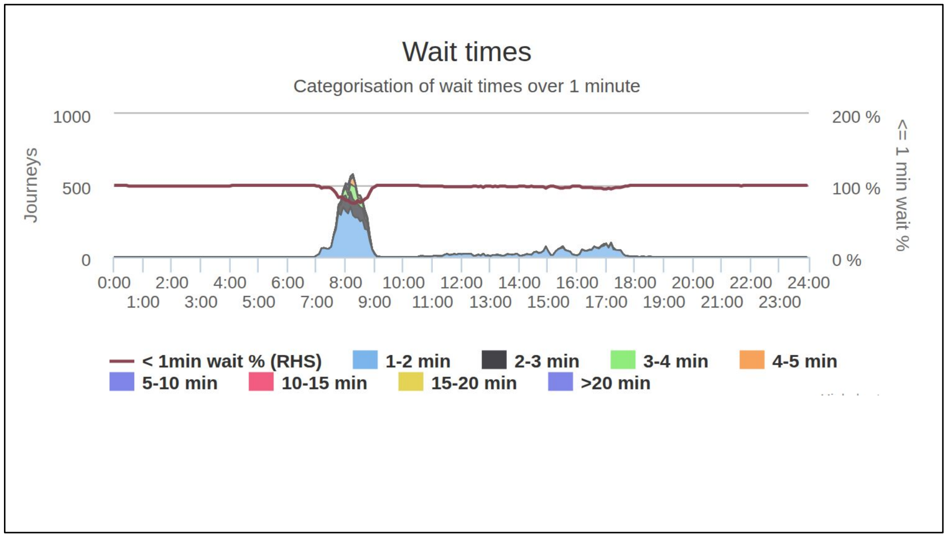
Base Model - Average Car Usage (Weekday)

Task	Trips/events	% of the day	Distance (km)
Carrying passengers	32.3 people 25.1 journeys	31	292
Transfers between trips	7.6	7	69
Transfers to charger	2.1	<1	6
Wait for charger	1.4	<1	
Charging	2.1	2	
Idle		59	

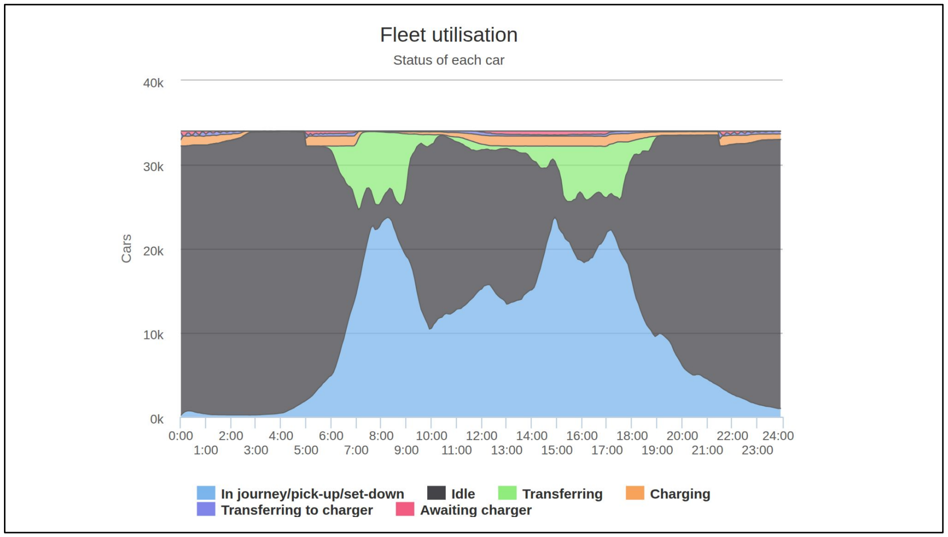


That's about 367 km/day (weekday)

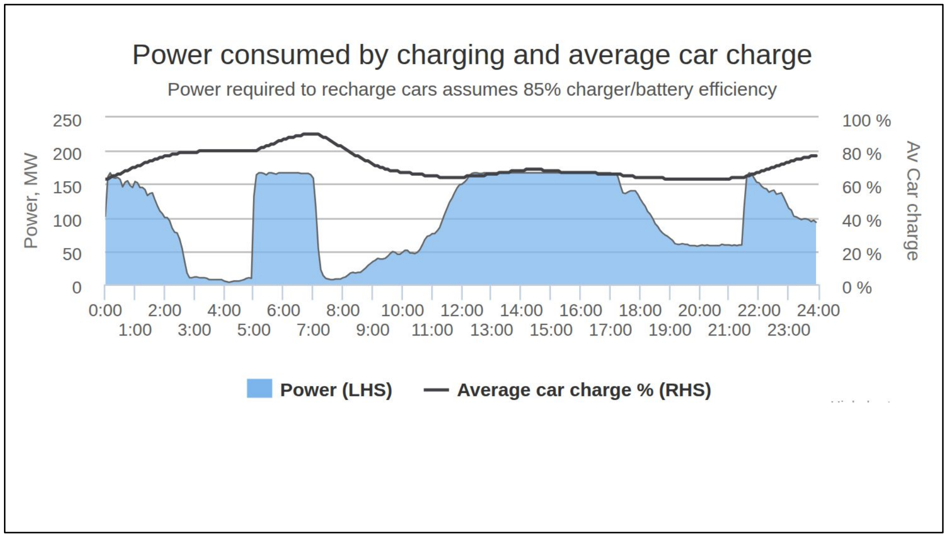
The grey area shows frequency of waits over 1 minute

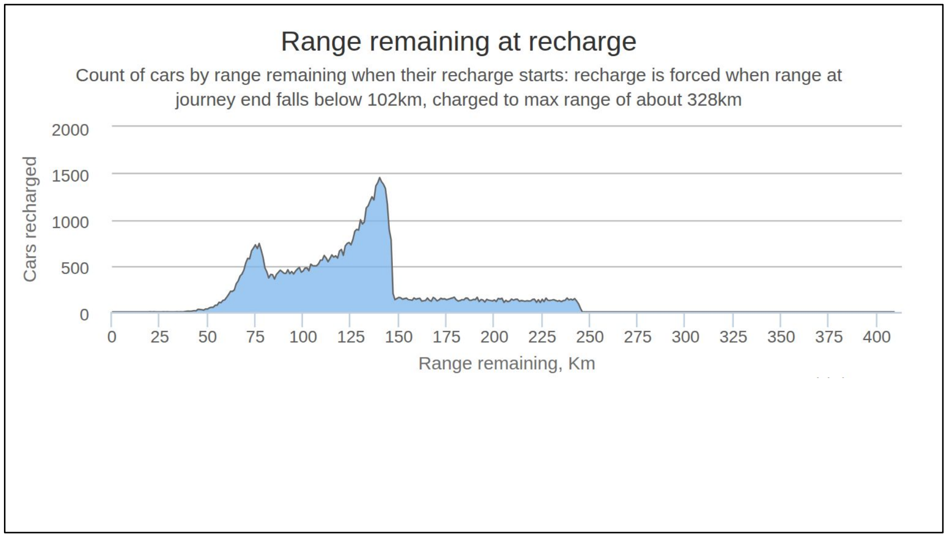


Frequency of wait times over 1 minute over the day



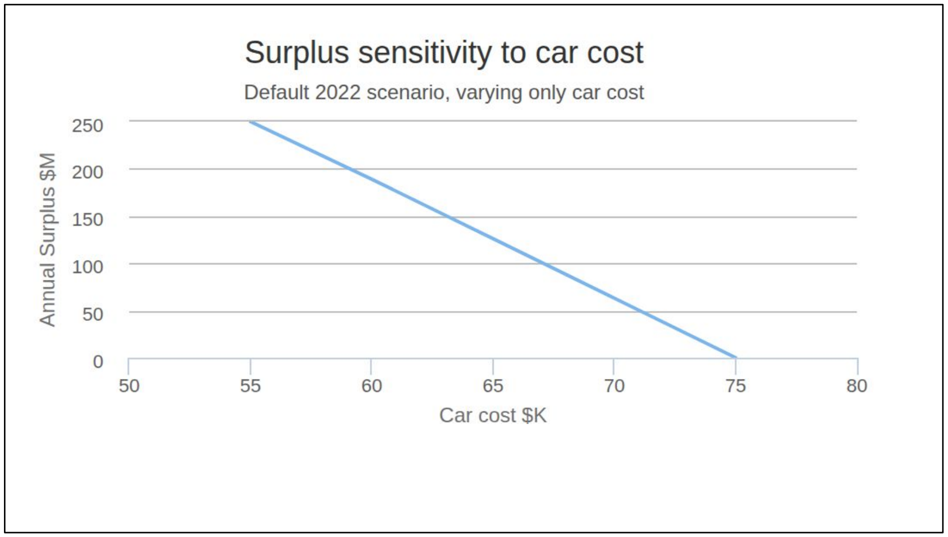
Even during the busiest minute, there are typically between 2500 and 2800 cars which have transferred to sources of peak demand and are waiting, idle.

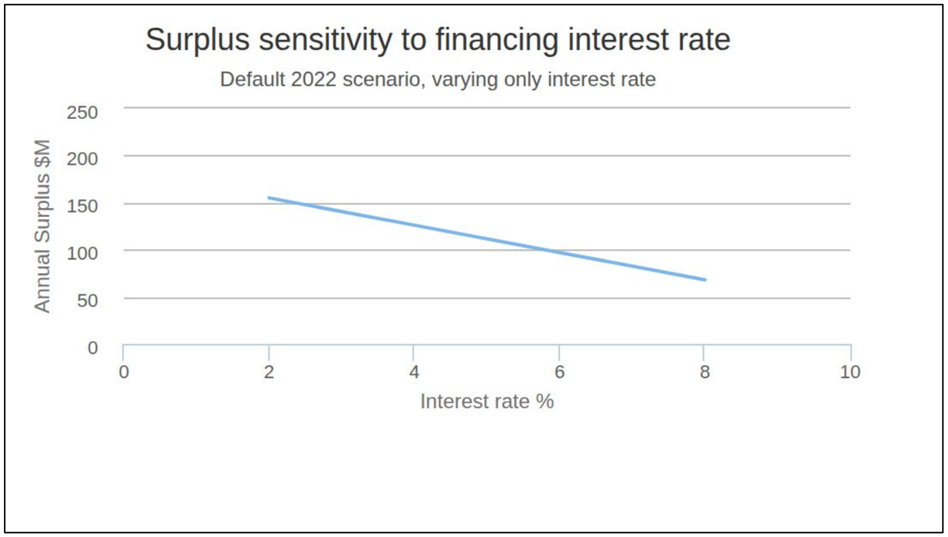




The blue area shows power use. In light of recent changes to demand and supply, the day mass charge should probably start at 9:30 rather than 11:30 and end at 4:30 rather than 6:30pm. And the overnight mass charge should continue to 5am rather than stopping at 3am and resuming at 5am - 7am.

Most cars are conservatively charged with plenty of range remaining.

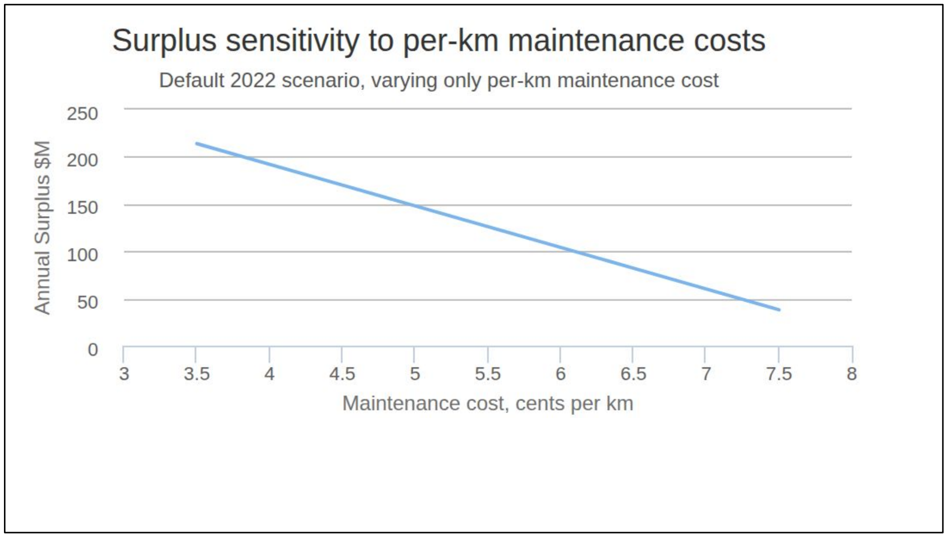


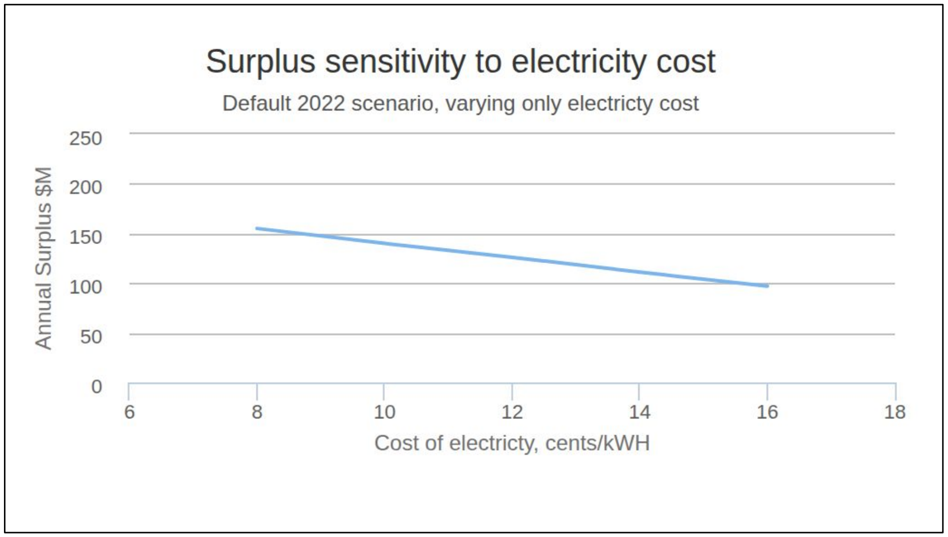


The "base" scenario is the Default 2022, with 34,000 cars, 1,200 charging stations and 1.1 million journeys per day, and only one parameter at a time is varied. Please note that the cost sensitivities were generated using a per-km-cost of 5.5 cents per km, rather than the current default of 6.0 cents per km. At 5.5 cents per km, a typical surplus of $127M is generated. At 6.0 cents per km, a typical surplus of $104M is generated.

As shown surplus is sensitive to car cost.

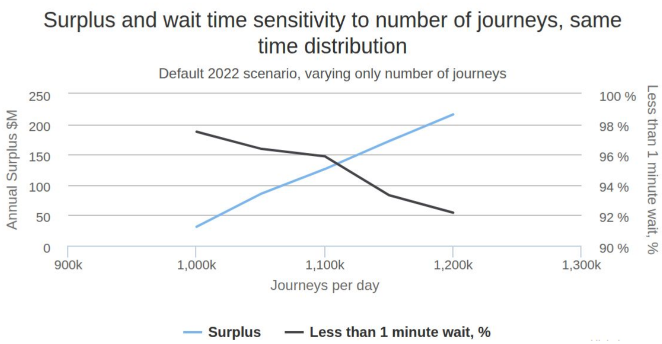
As shown surplus is sensitive to financing cost - this is capital intensive!





Labour is the second highest cost, and cleaning and maintenance is the biggest component of per-km costs.

Not very sensitive to power costs.



For a given fleet, wait times (most particularly at peak periods) are very sensitive to the number of journeys. Given the large financing fixed costs, surplus is also very sensitive to the number of journeys.

But what about congestion?

The more journeys, the greater the fleet utilisation and the more effective amortisation of the fixed capital costs that dominate determination of the surplus (blue line).
But as utilisation grows, wait times under 1 min fall (black line), along with customer happiness.

Congestion - morning peak

Current **1.1** **travellers/car**

Simulation **2.3 - 2.4** to most popular (*congested*) routes

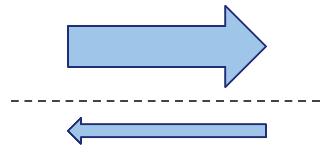
1.8 - 2.2 to popular destinations

1.6 - 1.7 network average

Congestion

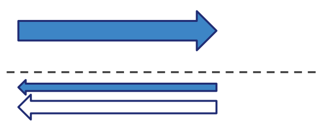
Q. **But don't the extra vehicle km travelled due to unoccupied transfers increase congestion?**

Unshared private vehicles



A. **No - journeys are unoccupied only in inverse proportion to demand for travel along that route.**

Shared AV fleet



In the Canberra morning peak, there are only 1.1 people in each car on average, and often that extra person is being driven to work by the other person.
With this simulation, we see 2.3 - 2.4 people per car to the most popular destinations along the most congested routes (Civic, Parkes, Barton), around 2 people to popular destinations (such as ANU, Belconnen, Russell, Woden) and 1.6 - 1.7 across the network.

Shared journeys drive a virtuous chain...

Shared journeys → Better, cheaper service → Higher uptake

Better, cheaper service

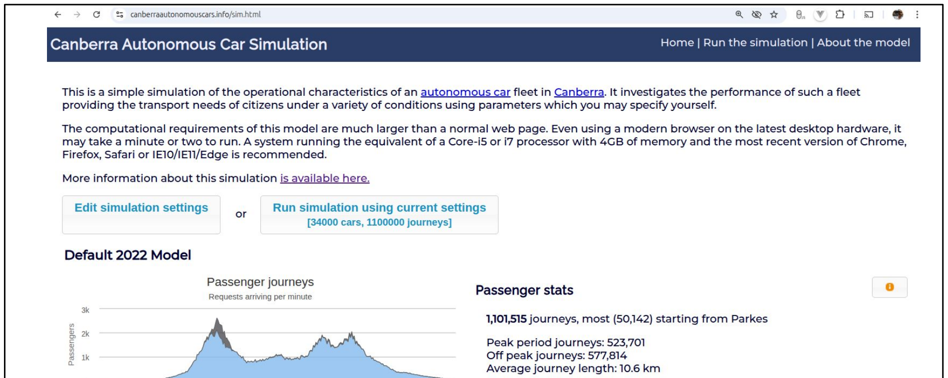
- Faster response
- Higher utilisation
- Lower costs
- Less congestion

Positive feedback

- Efficiency increases as average occupancy rises during peaks
- # of vehicles required increases slower than number of passengers

Conclusion

- Universal, safe, inexpensive, fast and efficient public transport promotes economic and personal productivity.
- A shared fleet of autonomous EVs with shared rides in peak periods makes this possible, AND reduces congestion and liberates real-estate.
- How will we make this happen?



http://canberraautonomouscars.info

You can run the simulation yourself at this site. Because journeys are randomised, each run will be different. You can change the assumptions and see how they affect the service and financial outcomes.

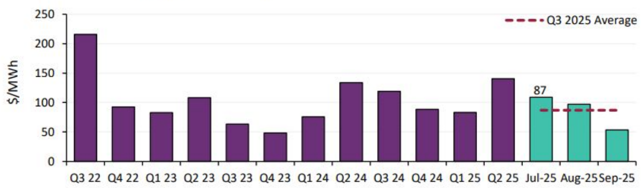
The journey-to-work data from the 2021 Census is also available for visualisation at this site.

Additional material which may come up in discussions

1. Cost of power assumption

Electricity Price Update November 2025

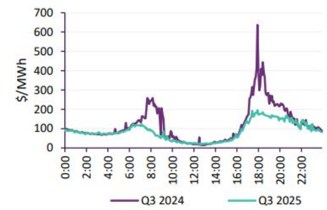
From page 11 of AEMO's [Quarterly Energy Dynamics Q3 2025, October 2025]:

> In Q3 2025, wholesale electricity prices across the NEM averaged $87/MWh, down 27% from Q3 2024 and 38% from Q2 2025 (Figure 8). Lower price volatility and higher renewable output offset the impact of increased operational demand, resulting in average prices of $109/MWh in July and $97/MWh in August. Seasonally lower demand and warmer sunnier weather conditions pushed September prices further down to $53/MWh.
>
> **Figure 8 Significant drop in NEM average wholesale prices**
>
> NEM average wholesale electricity spot prices – quarterly since Q3 2022
>
> 
>

For the 3rd quarter 2025, average wholesale prices for NSW were slightly higher at $90/MWh. However, across the network, average prices were much lower outside peak usage hours and particularly lower between 9am and 4pm. From the same AEMO report, Figure 11 on page 15:

Figure 11 NEM average prices dropped significantly during the morning and evening peak

NEM average spot price by time of day – Q3 2025 vs Q3 2024



Peak pricing roughly coincide with transport peaks, during which most cars in the simulation are not being charged, and it is possible to move almost all car charging outside peaks. Hence, a complementary and easily implemented preference for charging outside these peaks would result in a wholesale electricity price of well under $90/MWh, that is, under 9 cents per kWh. Wholesale electricty prices were negative in the NSW region for 38% of the dispatch intervals between 9am and 5pm in the September 2025 quarter (compared to 33% for the same quarter 2024). For the 2nd quarter 2025, only 7% of dispatch intervals in NSW had negative pricing, but this was more than twice the number recorded for the same quarter in 2024.

Tranmission charges need to be added to this wholesale power cost. From [Transgrid's NSW and ACT Transmission Prices 1 July 2025 to 30 June 2026], the cost of transmission for, example, at Belconnen is a fixed $3,299 per day plus three costs based on the maximum power demanded during the month: a common service price of $2.28, a non-locational price of $0.43 and a Belconnen connection point specific locational price of $3.45, all measured in $/kW of maximum demand over the month.

Based on the default 2022 simulation, the maximum power demand from 216 chargers at Belconnen delivering a net 120 kW (but drawing a gross 141kW from the grid with the assumed 85% end-to-end efficiency) is 30494 kW. The total transmission costs (max kw plus daily costs) for a 30.5 day average month are hence $287k. The total energy demand from the Belconnen chargers for the average month from a typical simulation run (assuming 70% energy usage on weekend days compared to non-weekend days) is about 12,828,000 kW. Hence the typical network charge is about 2.24 cents per kWh.

Hence, even allowing a pessimistic average wholesale cost of 9 cents per kWh and the "rack" Transgrid transmission cost of 2.24 cents per kWh, an allowance of 12 cents per kWh seems realistic.

Additional material which may come up in discussions

2. Workforce

Workforce estimates

The following workforce estimates are based the default model with 34,000 cars each travelling 125,000km/yr and 1,200 chargers.

Car cleaning and charging staff (gross labour cost at casual rate of $40/hr including superannuation, or permanent rate equivalent)

- Per-charger visit, check and cleaning: 6 minutes, at an average 2.1 charges/working-day and 1.5 charges/other-day = 70 hrs/car/yr
- Weekly clean: 15 minutes = 13 hrs/car/yr

For 34,000 cars, the annual labour requirement is 2.8m hours, which at 32 (productive) hrs/week and 46 weeks-per-person/yr requires 1900 cleaning and charging staff.

1900 people x 35 hours paid/week x 46 weeks paid/year = 3.06m hours

Total cost: 3.06m hr/yr paid at $40/hr (inc super) = $122.4m/yr.

A permanent full-time car cleaner and charger paid for a 35 hour week will earn $1250/week plus superannuation of $150/week. A casual car cleaner and charger will earn $35.71/hr plus superannuation of $4.29/hr.

Administrative/management overhead adds 130 admin/management staff paid $110,000/yr (including superannuation)
Total cost: 130 people x $110,000/yr = $14.3m/yr.

Mechanics/electricians (gross labour cost of $100,000/yr including superannuation)

- Mechanics/electricians repairs/Maintenance labour estimate: 26 hrs/car/yr
- Charger maintenance estimate: 10 hrs/yr/charger

For 34,000 cars and 1200 chargers, annual labour requirement is 0.9m hours, at 32 (productive) hrs/week and 46 weeks-per-person/yr = 600 mechanics/electricians.
Total cost: 600 people x $100,000/yr = $60m/yr.

Administrative/management overhead and specialist fleet acquisition/commissioning/management staff adds a further 90 admin/management staff paid $110,000/yr.
Total cost: 90 people x $110,000/yr = $9.9m/yr.

Other admin, technical specialist and management staff (average gross labour cost of $130k/yr)

- Corporate Management and support: 10 staff
- General Corporate (HR, finance, legal and marketing): 30 staff
- Technical specialists, scheduling and car systems: 20 staff
- IT support: 5 staff

Total: 65 staff, annual gross labour budget of $8.5m.

Other admin, technical specialist and management staff labour costs consumes 57% the model's default "Fixed Annual System Cost" budget on $15m. The remaining $7.5m is allocated to rent, equipment repairs and replacements, facilities, consumables and contracted services.

Workforce full-time-equivalent summary

- Cleaning and charging general staff: 1900
- Cleaning and charging management: 130
- Mechanics/electricians: 600
- Mechanics/electricians management: 90
- Corporate admin, technical specialist and management staff: 65
- Total: 2785 full-time-equivalent staff

Additional material which may come up in discussions

3. Income and expense summary

Annual income and expense summary for the default model

				Note
			$M	
Fare income			**$1282**	
Expenses			**$1178**	
Lease or capital & interest		$674		
Cars	$663.3			
Chargers	$10.1			
Workforce		$215		FTE: 2785
Cleaning and charging operational	$122.4			FTE: 1970
Cleaning and charging management	$14.3			FTE: 130
Mechanics/electricians operational	$60.0			FTE: 600
Mechanics/electricians/fleet management	$9.9			FTE: 90
Admin, technical specialist and management staff	$8.5			FTE: 65
Parts		$90		
Car tyres	$34.0			
Per-km related parts and consumables	$38.3			
Non per-km related parts and consumables	$17.0			
Charger parts and consumables	$0.6			
Insurances, rego, comms, workshop		$104		
Electricity		$87		
Other		$8		
Charger rent	$0.6			
Office rent, equipment repairs and replacements, facilities, consumables and contracted services	$7.5			
Operating Surplus			**$104**	

Additional material which may come up in discussions

4. ACT Public Transport Costs

1. Actucal costs are based on Transport Canberra's estimated 2024-25 outcome in the 2025-26 Budget Statement and the assumption that on average 1.3 boardings on average being required to complete a one-way journey: 17.3 million boardings results in roughly 13.3 million journeys. Transport Canberra's revenue (assumed mostly to be fares) was $15m, expenses were $310m, resulting in an average journey *actual cost* of about $23.30. The *Actual Cost* column includes the Transport Canberra subsidies averaged over all trips.
2. Based on the RACV Car Running Costs Survey 2023 for the cheapest-to-run (and high selling) medium SUV, Toyota RAV4 GXL 2.0 FWD CVT: based on 15,000 km travelled per year averaged over first 5 years of ownership, but not including parking, garaging, cleaning, the cost of driving is $1.00/km.
3. Based on default simulation parameters and including GST