

Tesla Model X



Electric Vehicles (EVs)

Renault Kangoo ZE



Should I get one?

Nissan LEAF



Mitsubishi iMiEV



Gill Hall and Ben Elliston

References August 2018

<https://myelectriccar.com.au/evs-in-australia/>

<https://www.motoring.com.au/tesla-model-x-2017-tow-test-106452/>

<http://renew.org.au/renew-archives/>

<https://actewaglevlution.com.au/>

<https://www.carsales.com.au/>

<https://reneweconomy.com.au>

<https://electrek.co/>

<https://www.drivezero.com.au/electric-cars-australia-history/>

<https://www.co2.earth/annual-ghg-index-aggi>

A few car manufacturers' websites

A few newspaper sites of car reviews e.g. <https://www.express.co.uk>

https://www.youtube.com/watch?v=CoZXJ0lhy_w

Why EVs are important

- **ultimately to prevent CO₂ emissions**

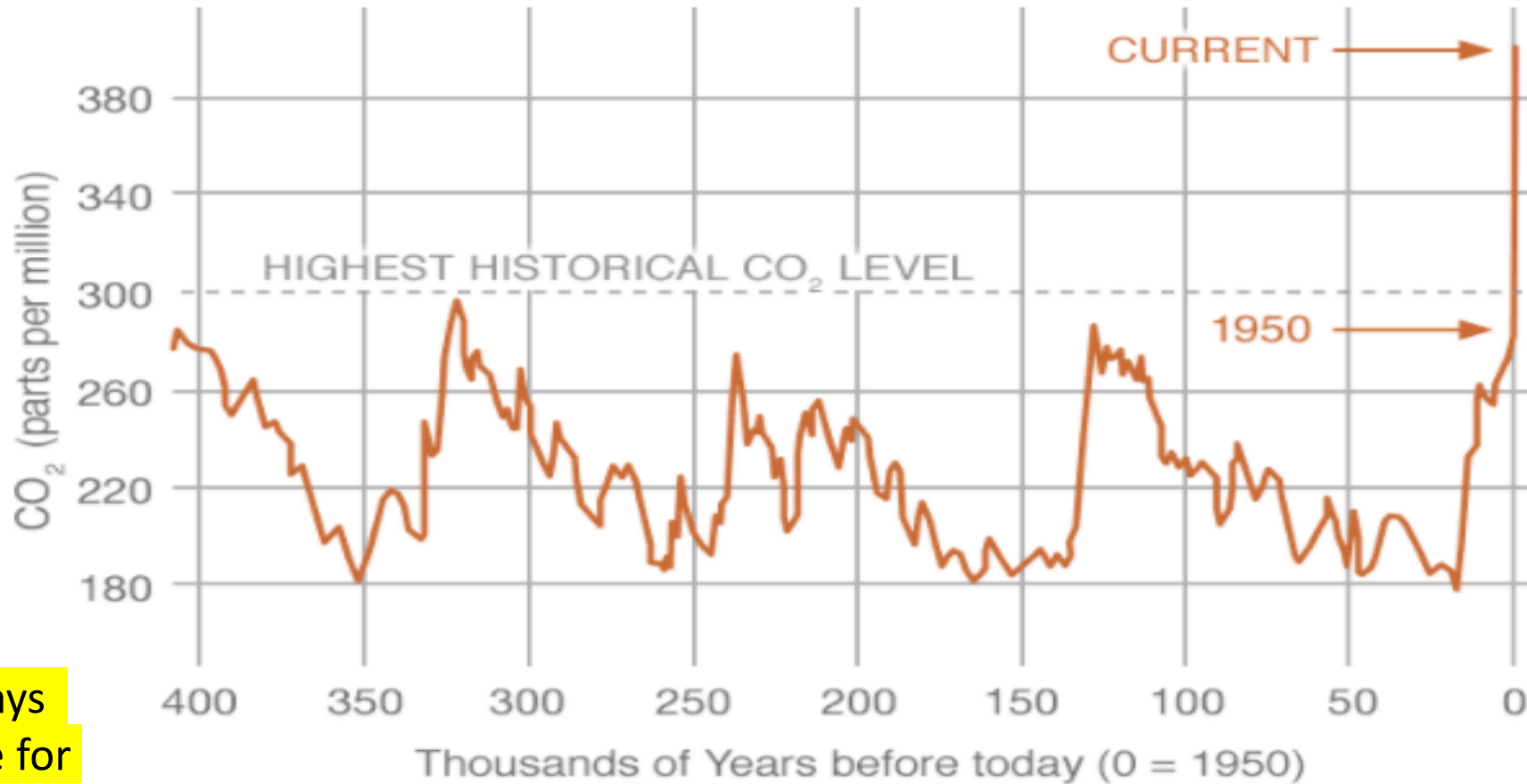
- Burning of fossil fuels is causing climate change
- Electricity generation from coal and burning of petrol for transport are major contributors

- other reasons include cleaner air, better driving technology

Carbon up in atmosphere

PROXY (INDIRECT) MEASUREMENTS

Data source: Reconstruction from ice cores.
Credit: NOAA



Carbon dioxide stays in the atmosphere for millennia

Some scientific facts 2018

1. Carbon has increased in atmosphere

– CO₂ now 400ppm

2. Man made CO₂ emissions have increased

– now 40Gt per yr (GHG* emissions 50Gt per yr)

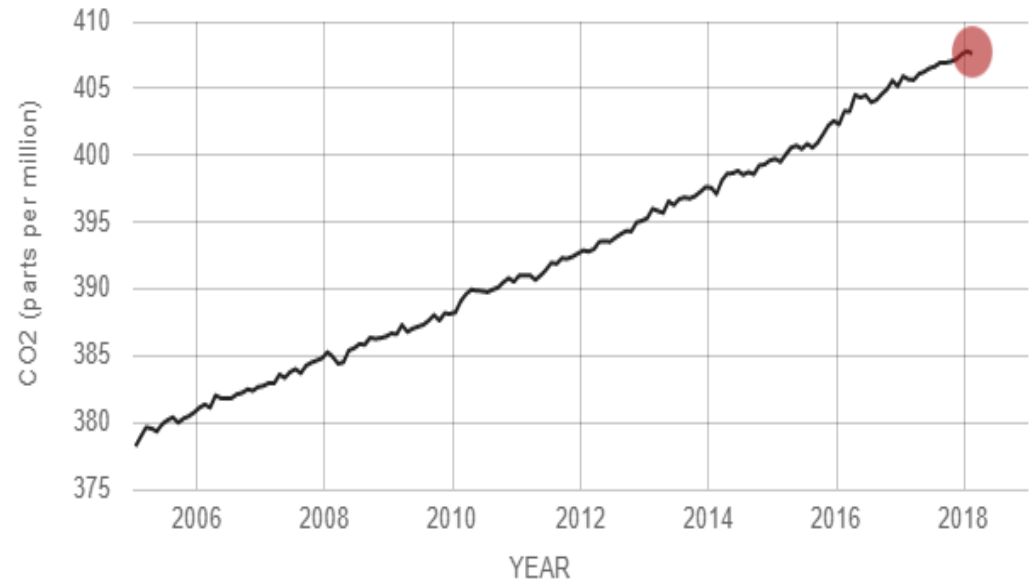
3. Temperature has increased globally – 1°C since 1970

4. Sea level has increased – 8cm since 1990

*18% methane – livestock, waste; 7% from NO – fertilizers; 59% CO₂ – fossil fuels; 16% CO₂ – Food and Land Use

DIRECT MEASUREMENTS: 2005-PRESENT

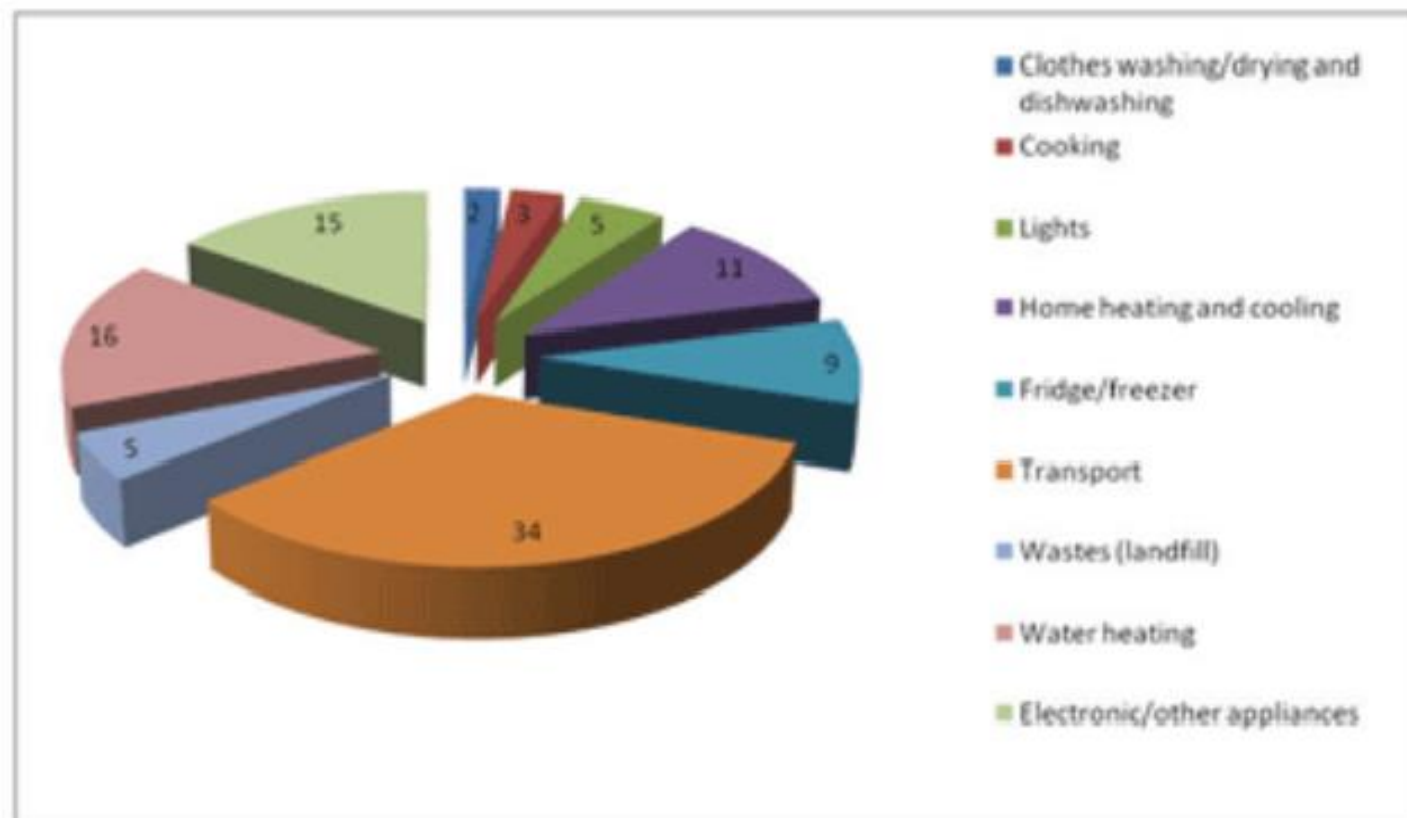
Data source: Monthly measurements (average seasonal cycle removed). Credit: [NOAA](#)



Source: NASA

An average Australian family's greenhouse gas emissions

- Transport is a major contributor to CO₂ rise
- It is a major component of household fossil fuel energy use



Source: Adapted from *Global Warming Cool it!*, copyright Commonwealth of Australia, reproduced by permission,

www.portstephens.nsw.gov.au/files/217567/File/Globwarm_Cool_It.pdf

Source: EPA Victoria

Is an EV a good idea?

Yes!!

- Especially if it can be charged without burning too much coal!
- But even if it is charged from electricity from non renewable sources, it is a good idea as EVs are very fuel efficient
 - If gas is used to generate electricity (40% efficiency) and that is used to charge EV (90% battery to wheel efficiency) then total efficiency is 36%
 - Internal Combustion Engine (ICE) vehicle efficiency is about 20%

What is happening around the world regarding Evs?

- Global Incentives for EVs – the main reasons world governments provide incentives are:

Environmental: Reduction in greenhouse gas emissions and air pollution

Health: Improved air quality in cities

Economic: Reduction in oil import bills and improved balance of trade figures

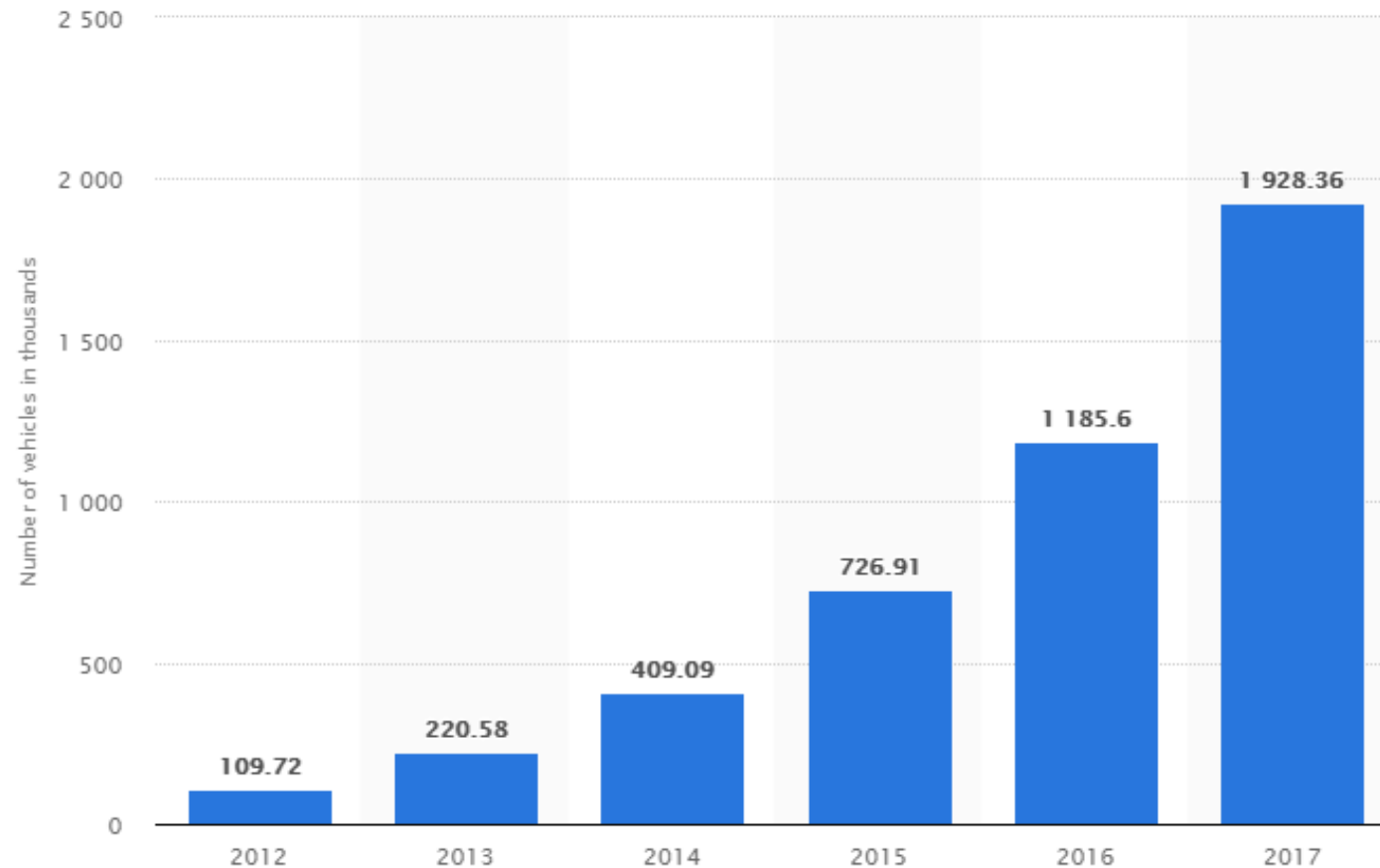
Strategic: Less reliance on foreign oil from politically unstable regions of the world

Countries with significant EV incentives:

Europe (Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Luxembourg, Monaco, Netherlands, Norway, Portugal, Romania, Spain, Sweden, United Kingdom)

USA, India, Canada, China.....

Worldwide number of battery electric vehicles in use 1



Number of different models of EVs = 44 listed as highway capable on wikipedia

Policy and action in Australia regarding EVs

- Limited B(battery)EV models available in Australia (n=7)
- Limited number of EV cars (n about 4,500)
- A lack of direct government incentives = manufacturers reluctant to bring their vehicles to Australia
- Current incentives
 - small bonus incentive in the luxury car tax
 - reduction of \$100 on car registration in Victoria
 - reduction in stamp duty in the ACT
 - 20% off rego in ACT
- It would seem we are just about [the only developed country in the world without direct incentives.](#)
 - ACT Govt has a plan
 - Greens have a policy
 - Parliamentary inquiry into EVs underway currently
- 7th Aug 2018 <https://myelectriccar.com.au/evs-in-australia/> <https://www.drivezero.com.au/electric-cars-australia-history/>

ACT Govt Zero Emission Vehicle Action Plan

April 2018

- Transitioning the ACT Government fleet to zero emission vehicles – 100% by 2020-21
- New multi-unit and mixed use developments to install vehicle charging infrastructure
- Zero emissions vehicles can drive in transit lanes
- Encourage charging stations on major routes to and from Canberra
- Incentives to encourage the use of electric bikes in place of cars
- This action plan will feed into the ACT's transport and climate change strategies.

https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2018/new-action-plan-to-drive-growth-in-electric-vehicles

Terms of Reference

Inquire into and report on the following matters:

- a. the potential economic, environmental and social benefits of widespread electric vehicle uptake in Australia;
- b. opportunities for electric vehicle manufacturing and electric vehicle supply and value chain services in Australia, and related economic benefits;
- c. measures to support the acceleration of electric vehicle uptake;
- d. measures to attract electric vehicle manufacturing and electric vehicle supply and value chain manufacturing to Australia;
- e. how federal, state and territory Governments could work together to support electric vehicle uptake and manufacturing, supply, and value chain activities; and
- f. any other related matters.

About this inquiry

- [Inquiry home page](#)
- [Submissions](#)
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- [Public Hearings](#)
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Upcoming Public Hearings

31 Aug 2018: MELBOURNE, VIC

What EVs are currently available in Australia?

- **Hybrids** e.g. Prius, many others
- **Plug in Hybrids (PHEV)** e.g. Mitsubishi Outlander
- **Battery Electric Vehicles (BEV)**

Tesla model S

Tesla model X

BMW i3

Renault Zoe

Renault Kangoo

Used vehicles only: Nissan LEAF 2014, Mitsubishi iMIEV 2010, Chevrolet Bolt?

7th Aug 2018 <https://myelectriccar.com.au/evs-in-australia/>



Many Hybrids e.g. Toyota Prius



Plug in Hybrids e.g. Mitsubishi Outlander PHEV

EVs Available in Australia August 2018 **Hybrids and Plug in Hybrid** EVs (PHEV)

MODEL	Battery size	Approx. recharge time *	Approx. Electric Range	Price	Style
Mitsubishi PHEV Outlander 2017	12kwh	4hrs	50km Tot fuel ~ 500km	\$50,490 Used \$28,000	SUV -tows 1.7L then 6.5L/100km
Hybrids					
Prius	4.4kwh	No Plug-in In Aust	23km Tot fuel ~800km	\$39,000 Used \$20,000	Small-med car 3.4L/100km
Others e.g. camry hybrid, corolla hybrid, audi, volvo options etc					

BEVs already in Australia 2018

Nissan LEAF



BMW i3



Mitsubishi iMiEV



Tesla Model S



Chevrolet Bolt?



Tesla Model X



Renault Kangoo ZE



Renault ZOE



Pictures of cars from myelectric website

BEVs Available in Australia August 2018 (all electric Battery EVs)

MODEL	Battery size	Approx. recharge time *	Approx. Electric Range	Price	Style
Tesla Model S	60 kWh or 85 kWh	9 hours	335km or 420km	\$105,000 up Used \$100,000 up	Mid size car
Tesla Model X	100 kWh	9 hours	400km	\$122,812 up Used \$140,000 up	Mid size all-wheel drive SUV-tows
BMW i3	16 kWh	3hrs	156 km	\$69,000	Smaller car. Gas engine option to 300km
Renault Zoe	41kwh	6-15 hrs	300km	\$48,000	Smaller car
Renault Kangoo	33kwh	6-11hrs	200km	\$51,000	Small van
Used Vehicles only					
Nissan LEAF 2014?	24 kWh	8hrs	100-120km	\$18,000-\$29,000	Smaller car
Mitsubishi iMiEV 2010	16kwh	4hrs	80-100km	\$13,000-20,000	Very small car

😊
\$50,000
300kms

Tesla Model 3



Nissan LEAF



Kia Niro



Hyundai Ioniq Electric



Hyundai Kona EV






Jaguar I-Pace



EVs coming to Australia
by end of 2019!

6 more BEVs Coming to Australia soon (2018-2019)

MODEL	Battery size	Approx. recharge time *	Approx. Electric Range	Price	Comments	
 Tesla model 3 \$50,000 350kms	50kwh	5hrs (48km/hr)	350km	\$47000	Due end 2019. Mid size car	
	75kwh	(71km/hr)	500km	\$59000		
	Kia Niro	39kwh	240km	\$40,000 up	SUV	
	64kwh	10hrs	380km			
 Nissan Leaf 2017	40kwh	6-8hrs	240km	\$39000	Smaller car	
\$40,000 240kms	Jaguar I-Pace	90kwh	9hrs	480km	\$112,000 up	Sporty car. 8yrs batt warranty
Hyundai Kona EV	39kWh	6hrs	312kms	\$55,000 up		
	64kWh	9 hrs	480 kms			
Hyundai Ionique Electric	28kWh	4.5hrs	200km	\$50,000	Mid size car Battery lifetime warranty	
Various hybrids and plug in hybrids					Eg Hyundai Ionique PHEV, Hyundai Ionique hybrid	

Compare fuel/electricity cost per year (smaller car)

(calculator on myelectriccar.com)

Australian average distance travelled is approx **15,000kms per year**

- **Petrol** Price per litre \$1.50
Petrol use litres per 100 kms – smaller vehicle 7.2L per 100km (corolla is 6.6L/100km)
Annual petrol cost \$1620
- **Electricity** Cents per unit (kWh)
Battery use kWh per 100kms based on Nissan Leaf of 16KWh
Off peak is 10pm to 7am – Red Energy in NSW is 18c per kwh
Annual off peak electricity cost \$432

Compare carbon emissions when recharging on NSW grid

CO₂-e emissions for a selection of petrol vehicles *

Vehicle	L/100K	Tonnes CO ₂ -e per 10,000km
Range Rover V8 5.0L	13.8	3.4
Commodore V6 3.0L	9.1	2.2
Toyota Corolla 1.8L	6.4	1.5
Mazda 2 Neo 1.5L	5.5	1.3

*city/country driving combo

CO₂-e emissions for BMWi3 in a selection of states

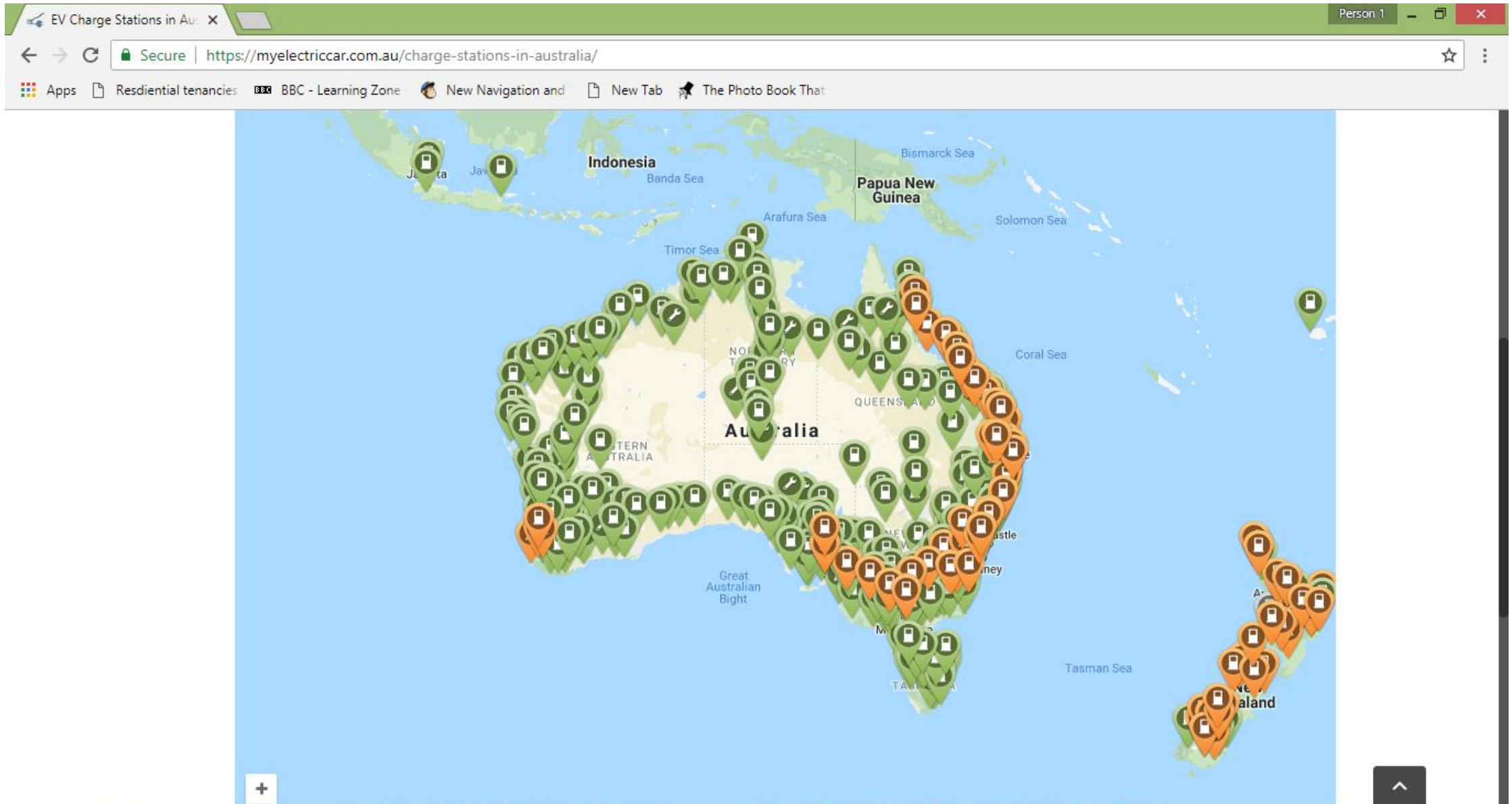
BMW i3	Kg CO ₂ -e per kWh	Tonnes CO ₂ -e per 10,000km
Vic	1.2	1.6
NSW/ACT	1.0	1.3
SA	0.6	0.8
Tas	0.2	0.2

Add your own PV panels to reduce CO₂ emissions further.....

Using a car battery to mop up excess electricity

- If you have PV panels and no battery storage, an EV battery is a place to dump excess electricity
- Recharging would need to be in the daytime – perfect for those who have their car at home in the day

Recharge availability





About FAQs Pricing

My Account - Log off

The map displays the Canberra region, including areas like Brindabella National Park, Lower Cotter Catchment, and Bullen Range Nature Reserve. It shows various service locations marked with colored pins: green for 'Available', yellow for 'Occupied', red for 'Out of Service', and grey for 'Coming Soon'. Major roads like M23, A23, A2, B52, and B23 are also visible. The map includes a legend in the bottom right corner and navigation controls like zoom in/out and a full-screen button.

Register

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Gambells Rest Campground



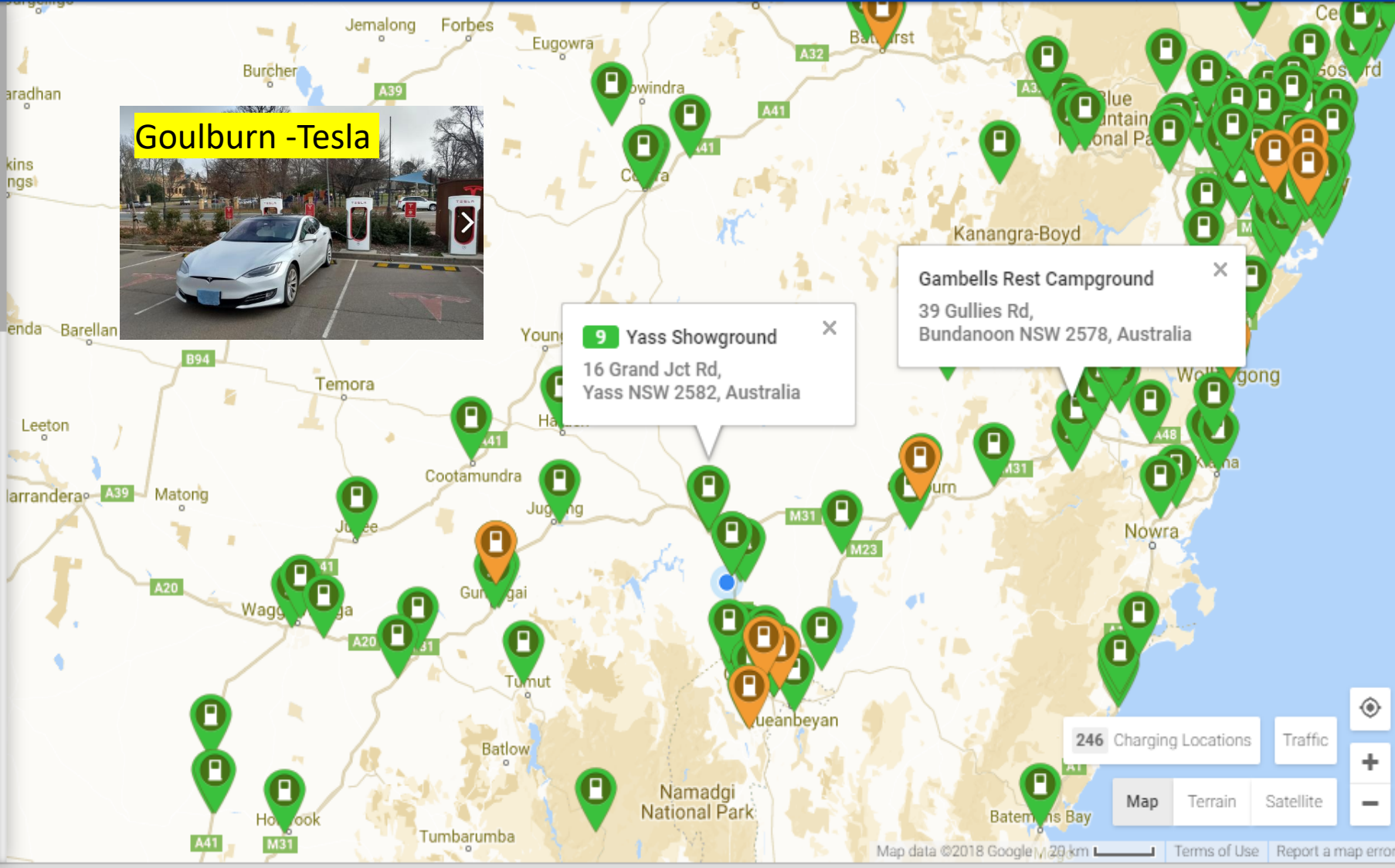
Gambells Rest Campground

Wall (AU/NZ)



- ★ BOOKMARK
- 📷 ADD PHOTO
- 📍 DIRECTIONS
- ✎ EDIT

- 📍 39 Gullies Rd, Bundanoon NSW 2578, Australia
- P Parking: Free
- ★ Restrooms, Park
- i Emergency power located here. 240V socket available. You'll need your own EVSE and



EV fast-charging network to roll out in Australia after funding boost



Fast Cities Australia is set to begin the rollout of a national backbone of fast charge stations each with a minimum of two 350kW fast chargers.

Having secured funding of \$7million to begin the project, Fast Cities Australia intends to deploy the first 16 sites linking Melbourne to Brisbane by the end of 2019. The aim is to complete all 42 planned sites by the end of 2021.

CEO of Fast Cities Australia stated, "That first 42 sites are what we call the national backbone. We would intend to then flesh out

further sites. Our genuine aim is to catalyse the industry... to increase the uptake of EVs in the country". [Read more here.](#)

<https://reneweconomy.com.au/ev-fast-charging-network-to-roll-out-in-australia-after-funding-boost-13345/>

Owning an EV in Murrumbateman 2018

Commuting to Canberra is about 100km return (80-120km) and fast highway driving depletes battery

CAR

- can be done to Belconnen with current Nissan Leaf (100km range)
- current EVs with range >200km are Tesla S and X (\$100,000+), Renault Zoe and Kangoo (\$50,000)
- 6 more EVs coming soon all do 200km+ with 5 in price range \$40-50,000

CHARGING

- we generally have NSW electricity supply; both cost of energy and CO₂ emissions are less than ICE car (and may have home panels for daytime charging)
- recharging options in Canberra are rather limited currently

Experience of owning an EV

Nissan LEAF – from Ben

“My experience with my LEAF has been excellent. It is a joy to drive. We charge almost exclusively at home during off-peak periods. Only rarely, we charge at public chargers (for example, if we forget to plug in the night before). We do a bit more public charging in the dead of winter when the LEAF battery gets cold, which reduces the range of the car (perhaps by as much as 20%). However, spring is about to spring and the range will recover again.”

Mitsubishi Outlander PHEV – from Gill

“It is a nice car to drive- rather bigger than I am used to but we got it to replace our ute as it will tow a trailer (1.5T). It does 50Km max pure electric then moves from EV to hybrid seamlessly and it will never run out of charge- going to Canberra and back is about 2L petrol. We plug it in during the daytime and charge 100% directly from solar panels. Recharging at public stations in Canberra has not worked so well as it takes 3 hours and ICE cars often take the parking spot (Grrrr). Going to the Palace cinema on Sunday evening works well for recharging!

After the first 100km it is a hybrid and uses about 6.5L per 100km.”

Tesla Model S 85D – notes after 5 years ownership by Chris Kelman

“I have found the Tesla to be a pleasure to drive, it is incredibly fast, handles well and is very smooth. It has a range of approx 400km on a full charge (depending on how you drive) – certainly enough for all local trips. I charge it almost entirely from my home off-grid system which is powered by mostly solar in summer and mostly wind in winter.

When doing longer journeys, it is very convenient to use the Tesla supercharger network – I have driven to both Brisbane and Melbourne using the network. One of the fringe benefits of driving an EV is not having to visit service stations – I didn't realise how much I would appreciate this!

As for service – there has been none required except swapping the tyres around every year, and filling the windscreen fluid.

My only slight reservation about this model is that it is a large car and I await the arrival of the more compact Model 3.

In summary, once you own an EV you will never go back... in retrospect, I find it surprising that ICE vehicles were ever legal considering the fact that they emit toxic gasses (one of which will reliably kill you if you run it in an enclosed space).”

“Drivers need to know that electric vehicles are coming; they should be thinking now that their next car will be an EV.

“All these cars are on their way and they’re fun vehicles to drive.
(Consumers) just need to have the confidence of knowing they can do it.”

Fast Cities co-founder Paul Fox



Appendix: details of EV makes and models

New Mitsubishi iMiEV ?2018

Range – up to 240 kms

Acceleration – 0 to 100kph less than 10 secs

Top Speed – 144 kph (regulated)

Luggage Space 435 litres

Seats – 5 adults

ProPilot Assist semi-autonomous technology

ProPILOT Park, One foot e-Pedal operation

Pure Electric

Charge Time 6.6kW – 8 hours

ChaDeMo quick charge – 80% charge in 40 mins

40kWh lithium ion battery pack

Drivetrain – front wheel drive

Price: \$29,990 (US dollars)

Mitsubishi iMiEV



SECOND HAND ONLY IN AUSTRALIA. ABOUT \$13,000 TO \$20,000.

Nissan LEAF



- Range – up to 240 kms
Acceleration – 0 to 100kph less than 10 secs
Top Speed – 144 kph (regulated)
Luggage Space 435 litres
Seats – 5 adults
ProPilot Assist semi-autonomous technology
ProPILOT Park
One foot e-Pedal operation
- **Pure Electric**
Charge Time 6.6kW – 8 hours
ChaDeMo quick charge – 80% charge in 40 mins
40kWh lithium ion battery pack
Drivetrain – front wheel drive
- New Price: \$29,990 (US dollars). **SECOND HAND ONLY IN AUSTRALIA, 2012?? MODEL. COST ABOUT \$21,000**

- Range – up to 480 kms
Acceleration – 0 to 100kph approx 4.2 secs
Top Speed – 190 kph
Seats – 5 adults + 2 kids
Front cargo space & rear hatch
Flat folding rear seat
17 inch touchscreen
- **Pure Electric**
Twin Charger – 5 hours
Supercharge – 50% charge in 20 mins
Battery Swap – 5 mins
Powertrain – 310kW
Battery Pack – 60kWh or 85kWh
Drivetrain – single speed
- Price Starts at USD \$71,000

Tesla Model S



Tesla Model X

- Range – up to 489 kms
Acceleration – 0 to 100kph approx 4 secs
Top Speed – 190 kph
Seats – 7 adults, falcon wing rear doors
- All Wheel Drive
- Flat folding rear seat
17 inch touchscreen
Crossover Utility Vehicle (CUV)
- Can tow 1,588kg – 2,280kg:
<https://www.motoring.com.au/tesla-model-x-106452/>
- **Pure Electric**
Twin Charger – 5 hours
Supercharge – 50% charge in 20 mins
Powertrain – 75kWh or 90kWh
Models – 75D | 90D | P90D
Drivetrain – single speed
- Price around USD \$80,000



- Range – 190 kms
With Range Extender Gas Engine – up to 300 kms
Acceleration – 0 to 100kph approx 7.2 secs
Top Speed – 150 kph (regulated)
5 Door Hatch
Seats – 4 adults
- **Pure Electric**
Charge Time – 8 hours
Fast Charge – 80% charge in 30 mins
Powertrain – 125kW electric motor
Drivetrain – rear wheel drive
- Price: around AUD \$75,000

BMW i3



- Range – 300 kms (NEDC range 400kms)
Acceleration – 0 to 100kph approx 13.5 secs
Top Speed – 135 kph
Rear Cargo Space – 338 litre
Seats – 5 Seater
NCAP – 5 Star Rating
- **Pure Electric**
Battery Pack – 41kWh
Charge Time – 7KW single phase 32A – 7hours 30mins
Charge Time – 22KW three phase 32A -2hours 40mins
Rapid Charge 50kW – 0-80% in 60 mins
65kW electric motor

Renault ZOE



Range – 200 kms (NEDC range 270kms)

Acceleration – 0 to 100kph approx 22 secs

Top Speed – 130 kph

Cargo Volume – 2 x m³

Seats – 2 Seater

Doors – 4

Body Type – Panel Van

Pure Electric

Battery Pack – 33kWh

Charge Time – 3kW Single Phase 16A – 11 hours

Charge Time – 7kW Single Phase 32A – 6 hours

75kW electric motor

Drivetrain – front wheel direct drive

Price: AUD \$51k Drive Away

Renault Kangoo ZE



Range – 380 kms long range version
Range – 240 kms short range version
Acceleration – 0 to 100kph around 7.8 secs
Top Speed – to be confirmed
Cargo Space – 451L
Seats – 5 adults

Pure Electric

Fast Charge – 80% in 54 mins (long range version)
Power Pack – Long range 64-kWh lithium-polymer
Power Pack – Short range 39.2-kWh lithium-polymer
Drivetrain – Front wheel drive
Single Speed constant ratio drive

Price: Around AUD \$40,000

Kia Niro



Hyundai Ioniq Electric

Range – up to 200 kms

Acceleration – 0 to 100kph approx 9.9 s

Top Speed – 165 kph

Cargo Volume – 23.8 cuft

Seats – 5 adults

Pure Electric

Charge Time about 4.5 hours 240v

DC Fast Charger 80% in 33 mins at 50kW

Powertrain – 88kW electric motor

Drivetrain – front wheel drive

28kWh lithium ion battery pack

Battery Warranty – lifetime warranty

Price: Around AUD \$50,000



Hyundai Kona EV

Range – up to 480 kms (64kWh battery)
Range – up to 312kms (39.2kWh battery)
Acceleration – 0 to 100kph approx 7.6 secs
Top Speed – 155 kph
Cargo Volume – 332L
Seats – 5 adults

Pure Electric

Charge Time 240v – 9hrs 35min (64kWh model)
Charge Time 240v – 6hrs 10min (39.2kWh model)
Fast Charger 80% in 50 mins (both models)
Efficiency (kWh / 100 km) 13.9 & 14.3
Drivetrain – front wheel drive
Battery Warranty – unknown
Price: Around AUD \$55,000



Jaguar I-Pace

Range – up to 480 kms

Acceleration – 0 to 100kph approx 4.8 secs

Top Speed – 200 kph

Cargo Volume – 656L

Seats – 5 adults

Pure Electric

Charge Time 240v – 10 hours

DC Fast Charger 80% in 40 mins

Powertrain – front & rear electric motors

Drivetrain – All wheel drive

Battery – 90kWh

Battery Warranty – 8 years/160,000kms

Over the air updates

Price: Around AUD \$119,000 base mode



Range – up to 240 kms

Acceleration – 0 to 100kph less than 10 secs

Top Speed – 144 kph (regulated)

Luggage Space 435 litres

Seats – 5 adults

ProPilot Assist semi-autonomous technology

ProPILOT Park

One foot e-Pedal operation

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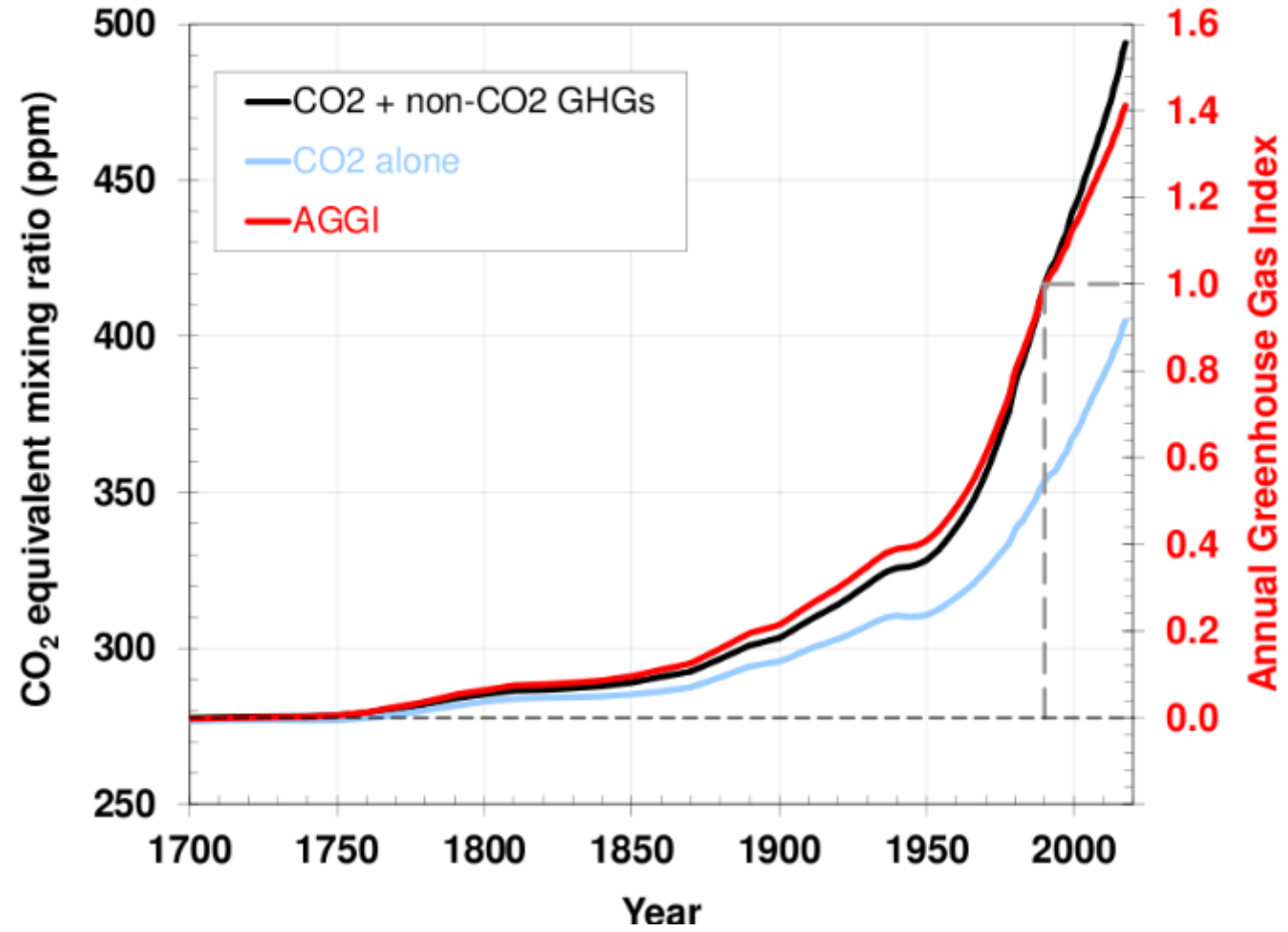
Nissan LEAF



Standard Model 3 Range – 350kms
Long Range Model 3 Range – 500kms
Acceleration Standard – 0 to 100kph 5.6 secs
Acceleration Long Range – 0 to 100kph 5.1 secs
Top Speed – Standard 209kph – Long Range 225kph
Seats – 5 adults, front cargo space & rear hatch
(400L), flat folding rear seat
Landscape 15inch touchscreen
Autopilot/Autonomous Hardware
Supercharging Ability
Highest Safety Rating All Categories
Pure Electric
Twin Charger – approx 5 hours
Supercharge Rate – Standard 209kms in 30mins
Supercharge Rate – Long Range 273kms in 30mins
Battery Pack – 60kWh (plus other options)
Drivetrain – single speed, rear wheel drive
Standard price starts at USD \$35,000, long range
price at USD \$44,000

Tesla Model 3





CO₂-equivalent concentration based on the ongoing measurements of all greenhouse gases

Battery replacement

Batteries wear out and a replacement battery will eventually be needed.

“ The average kms per annum for Australian motorists is approximately 15,000kms so an owner will expect to replace the batteries about every 7 years. To allay owners fears of hefty replacement costs, vehicle manufactures are coming up with novel, inexpensive replacement plans – for example a replacement battery for the Nissan Leaf will cost owners US dollars \$100 per month.”

[Nissan guarantee their batteries](#) against defects for 96 months or 160,000 kms (whichever occurs earlier) and capacity loss for 5 years or 96,500 kms (whichever occurs earlier).

Note: Nissan guarantee was not available for the earlier model in Australia

7th August

<https://myelectriccar.com.au>