Getting Australians ready for Electric Cars 



PEUGEOT 3008 GT SPORT PHEV AWD

Discover electrifying AWD style with full electric mode plus the convenience of a combustion engine for longer trips.

VISIT YOUR LOCAL DEALER



Drive: Electric

Electric vehicles represent the biggest change to our everyday transport since we swapped horses for horsepower. Fast. Silent. Cost-efficient to run. New technology brings many

benefits, but these are still early days, and there is plenty to learn with still some barriers to overcome

For example, if you didn't recognise an electric car charging plug on the cover of this liftout, you're not alone. If you're considering going

electric for your next car - or even vour next, next car - vou need to think of what type will you choose,

Which factors affect range?

Fully electric cars on sale in Australia offer an average range of around 430km. For urban dwellers, this is more than enough for most days, up to a week even, but if you are heading out on a country run, can this range be guaranteed?

Just as adding weight, carrying loads on the roof or towing will affect the efficiency of a petrol or diesel car, these will affect the range of an EV. The same goes for a heavy right foot, as aggressive acceleration will use more energy as it would chew more fuel. Extreme temperatures at both ends of the scale will also affect an electric vehicle. Energy is needed to warm the battery to its operating temp during winter, and air conditioners draw more power to cool the car in summer.

Where a traditional petrol or diesel engine will operate more efficiently on long highway runs, an

James Ward

How long does it take to charge an electric car? It's the easiest question to ask, but the hardest to answer because, quite simply, it depends. It depends on how 'fast' your

charge a vehicle can handle, and how much you need to charge. It's not as complex as it sounds, though, and you can use a simple high-school mathematics formula

to work everything out: Power = Volts x Amps. In the same way a petrol car's fuel efficiency is measured in litres per 100km, an electric car's energy use is measured as kilowatt hours per 100km, or kWh/100km. Right now, an average electric car uses 20kWh/100km. While ~15kWh/100km) and some use more (Audi E-Tron S ~25kWh/ 100km), 20kWh will be our base for the recharge calculation.

A home wall plug, the slowest but most universal charging method, has 240V on a 10A circuit for a 240V x 10A = 2400W or 2.4kW.

charge to our car – enough to drive 100km - will take about eight hours and 20 minutes. So, 20kWh required, divided by 2.4kW charging = rate of charge.

Polestar 2 100% electric

Book a test drive at polestar.com/au

WLTP: 16.5-20.2 kWh/100 km and CO2: 0 g/km



SZIVE 3

where and how will you charge it, and how can you get the most benefits and value from it.

As with any new technology, there is a lot to cover, and not all questions have answers - yet. But it's an addition of choice that

is happening right now, and you may be surprised to find things are not as complicated as you imagined.

For even more information, context and just a bit of fun, you can watch our one-hour documentary Drive: *Electric* at 3:00pm, this Sunday 16 October on Channel Nine, or catch up later on 9Now.

electric car tends to work better around town. Here, energy recaptured during braking is used to charge the battery, making a stopstart run in peak hour far more energy friendly than a sustained drive at highway speeds. Just as a bigger fuel tank will

extend your time between service station visits, a bigger battery will give an FV longer range. As noted. the average is a bit over 400km, with the current range leader the 625km BMW i7 Limousine.

As to what lies in store, we're already seeing claims of over 700km from EVs in other markets and the Mercedes-Benz Vision EQXX concept car has managed an impressive 1000km run from a 100kWh battery.

Can you drive from Melbourne to Sydney on a single charge? Not today, but it won't be long.

James Ward



HYBRID ELECTRIC VEHICLE (HEV) -'HYBRID'

A closed-loop hybrid is currently the most common type of electrified vehicle in Australia. Hybrids combine a traditional petrol engine with a battery and electric motor to reduce fuel consumption. The battery in the hybrid is charged through driving so they never need to be plugged in. Brands which produce hybrids include Toyota, Lexus, Kia and Haval,

PLUG-IN HYBRID ELECTRIC VEHICLE (PHEV) - 'PLUG-IN'

Like a hybrid, PHEVs feature a petrol engine that works in tandem with an electric motor. Here though, the battery is bigger, allowing a PHEV to drive anywhere from 40 to 100km on electric power alone, using the petrol engine as a power source once the battery range is depleted. As the name suggests, PHEVs need to be plugged in to recharge the battery. Brands which produce plugin hybrids include Mitsubishi, Ford, Peugeot and BMW.

BATTERY ELECTRIC VEHICLE (BEV) - 'EV'

The poster children of electric cars. EVs are fully-electric vehicles featuring a large battery array that powers one or more electric motors. With driving ranges of anywhere between 250 to 600km, EVs require charging, either at home or at public charging stations. Brands which produce EVs include Audi, Nissan, MG and perhaps the best known, Tesla.

The easy truth about charging

charger is, the maximum rate of

That means to add 20kWh of



some cars use less (Tesla Model 3 it's basically an overnight charge to range in under three hours. add 100km of range. If you only drive 50km, your wall charger should be able to add that amount of range in 11kW and the ability to shave even four hours and 10 minutes.

Conversely, if you need to add you've got is your trusty wall sockmaximum of 2.4kW of power: et, you had better settle in as that will take at least 33 hours. Ouch.

The good news is things only get faster from here.

you to use a 30-Amp circuit for dle it, mere minutes. three times the power of the stand-

And stepping up to public AC charging gives you the option of more time off that 100km fill.

But things get really interesting, 400km of range (80kWh) and all and convenient, with direct current (DC) fast- and ultra-rapid charging. Life here begins at 50kW and climbs.

This means you can add 100km range in under 30 minutes, or if Adding a wallbox at home allows your car and the charger can han-

ard socket (240V x 30A = 7200W options are available to all vehicles.

While that sounds like a long time, or 7.2kW). This gives you 100km For example, some plug-in hybrid cars can't charge any faster than a home wallbox can offer, and even popular electric cars like the MG ZS EV are capped at a maximum charge rate of 76kW DC.

The Hyundai Ioniq 5, Kia EV6 and Genesis GV60 can handle 350kW charging, where the Porsche Taycan and Audi E-Tron GT can take 270kW. Everything else is somewhere in between.

This means you need to get to know your electric car and understand its charge rate and maxim-Unfortunately, not all charging um capability in order to properly manage your charging plans.



The Kia EV6 (above and below) is of few cars that can h 350kW charging. Photos: Ted Airey



HOW WE GOT HERE: 1888 TO PRESENT

JJIVE



Experimental years

1888 First electric car, the Flocken Elektrowagen - 0.9kW power 1898 Porsche Egger-Lohner C.2 Phaeton - 3kW power 1906 Edison-Baker, 800 electric cars -1.3kW power

Commercial use

1940s Electric milk floats gave the UK more electric vehicles on the road than the rest of the world combined; 45km range 1950s Electric carts take the golf world by storm: 15km range



1960s Battronic electric truck with tonne payload; 100km range 1970s Electric power heads to outer space: the Apollo Lunar rovers had guad-motors and a range of approximately 90km

1997

you're not alone. Think of it

as a Spanish Volkswagen

(Cupra is owned by the

far from just another

on sale in Australia.

expected to be around

the Cupra Born could

GWM Ora Good Cat

The delightfully-named

Ora Good Cat could well

become Australia's most

affordable electric car

wheel design however,

wasn't the most remarkable

thing about the Seattle-ite.

Its propulsion came from a

compact nuclear reactor.

radiation poisoning at the

Unlike nuclear power, solar

alternative. At least one

top of the list of cons.

LIGHT-YEARS

cars offer a viable

AHEAD

The industry soon

abandoned the idea of

nuclear power with,

could drive around 8000km unsurprisingly, the risk of

City car

▶ 2023

▶ 420km

of buyers to EVs.

Volkswagen Group), and

compact hatchback, the

you'd be on the money. But,

Cupra Born promises to be

the first electric 'hot hatch'

With a driving range of

492-548km and a price tag

\$60,000 when it lands here

in the first half of next year,

attract a whole new breed

Consumer electric cars 1974 Sebring-Vanguard Citicar; more

than 4000 made with up to 64km range 1996 General Motors EV1; first 'big brand' EV; battery up to 26kWh; 1100

made 1997 First Toyota Prius Hybrid

With Australians buying

manufacturers are finally

seriously. Over the next

12-24 months, at least 40

make their way Down

ones we know about.

new makes and models will

Under. And they're just the

A blend of - hopefully

high-end luxury, the list of

Australia includes the first

dual-cab ute and the first

biggest carmaker, Toyota.

Here's our pick of the

what's coming. For more

years, scan the QR code

available over the next two

EV from the world's

detail on what will be

Cupra Born

Hot hatch

Early 2023

If you haven't heard of

GOING NUCLEAR

nuclear power in the 1950s

with several manufacturers

Ford in particular, was lured

by the prospect of a car that

The 1958 Ford Nucleon

concept never made it past

the scale model stage, but in

toying with atomic cars.

before needing to be

1962 Ford unveiled its

Seattle-ite XXI concept

(pictured above). Its six-

refuelled.

The car industry wasn't

immune to the lure of

Spanish brand Cupra,

492km

here.

cheap and cheerful and

electric cars coming to

starting to take our market

it's no surprise

more EVs than ever before,

Every electric vehicle on sale in Australia right now

Rob Margeit

If you wanted to buy an electric car a decade ago, you had just a single option.

The Nissan Leaf was introduced to Australia in 2012, an EV pioneer, not just here but around the world. But, as the market for

electric vehicles has expanded globally, so too has our choice. From that single Nissan in 2012, Australians today have a choice of 36 models from 18 different car makers. And the list is growing. Our snapshoot here lists every model available today

For a more comprehensive look at every electric car on sale today, scan the QR code in the middle of the page to check out drive.com.au's Electric Vehicle hub.

UNDER \$50,000

The field is a small one Batteries are expensive to produce and while advancements and scale will see manufacturing costs decrease, for now the most affordable EV in Australia remains priced well over \$40,000.



MG ZS EV

- Small SUV
- \$44,990 drive-away

360km The MG ZS EV has, since arriving here in 2020, held the mantle of Australia's most affordable electric car. It's a title under attack from a host of new challengers, but for now, at \$44,990 drive-away, the MGZSEV is the most

affordable. MG updated the electric SUV last month, increasing driving range to 360km (up from 263km) and adding some refinement to features like the infotainment system. MG also tweaked external styling.

BYD Atto 3

- Small SUV
- \$44,381

• 410km After much pre-launch hype, the BYD Atto 3 has finally gone on sale in Australia and while it doesn't quite match the MG ZS EV in

terms of price, it trumps its compatriot with greater driving range (410km against the MG's 360km). Inside, it's hard not to be

wowed by the BYD Atto 3 with a futuristic-looking cabin that



provides plenty of technology and comfort in a package that dares to be a little bit different

Incidentally, BYD is an acronym for 'Build Your Dreams'. No, really.

Hyundai loniq Electric

Hatchback \$49,970 > 373km

\$50,000-\$120,000 The sweet spot in terms of EV

pricing, this segment features some of the most popular models Australia right now.

Nissan Leaf

- Hatchback \$50,990
- > 311km

Hyundai Kona Electric Small SUV

\$54,500 305km Mini Cooper SE

City car \$55.650 233km

Polestar 2

Medium sedan \$63,900 • 440km

Kia Niro EV Small SUV \$65.300 • 460km

Mazda MX-30 Electric Small SUV \$65,490

Tesla Model 3

▶ 224km

- Medium sedan \$65,500
- ▶ 559km Ask anyone to name an

electric vehicle, and there's a better than even chance the first name past their lips is 'Tesla'

The Tesla Model 3 is Australia's best-selling EV,



eclipsing the competition by a significant margin. And it's easy to see why.

With modern styling, a driving range at the upper end of the EV market and brand cachet that is off the charts, the only threat to the Model 3's dominance comes from within, the Model Y medium SUV that launched earlier this year is already close to overtaking its sedan stablemate on the sales



Hyundai loniq 5 Medium SUV

\$69,900

charts.

430km The Ioniq 5 isn't the first EV from Korean brand Hyundai, but it is the most striking visually. Underneath that angular yet futuristic exterior is a medium SUV with a driving range of either 430km or 480km depending on the

model. It while it might not look like it in photos, its hatchback

proportions disguise what is actually a medium SUV, more akin to a Hyundai Tucson than an i30 Hyundai has future-

proofed the Ioniq 5 too, capable of accepting 350 kWDC fast charging. And that means as those ultra-rapid hargers come only Australia, the Ioniq 5's battery will be able to be replenished from 10 to 80 per cent in a matter of minutes.

Tesla Model Y Medium SUV

▶ \$72,300 ▶ 510km

Kia EV6 Large SUV \$72.590

• 484km The first electric car from Korean brand Kia blends edgy exterior design with a cabin

that is minimalist and

three variants available with driving ranges from 484km to 528km. And a bolder, more

modern. There are currently

performance-focused EV6 GT will join the line-up later this year, promising to complete the sprint from zero to 100km/h in just 3.5 seconds.

Volvo XC40 Recharge Pure

Small SUV \$72,990 ▶ 450km Lexus UX300e

Small SUV

Electric

\$74,000 🕨 360km

Volvo C40 Recharge Small SUV

\$74.990 ▶ 500km

Mercedes-Benz EQA Small SUV

\$78,513 475km

Mercedes-Benz EQB Medium SUV

\$87.800 ▶ 445km

Don't let the Mercedes-Benz EQB's medium SUV classification fool vou. Lurking inside its compact exterior lies a seven-seat interior, a feature buyers are increasingly gravitating towards.

Two variants underpin the EQB line-up with driving a range of 445km for the entrylevel model. The more expensive variant has a range in excess of 500km. The EQB forms part of

Mercedes-Benz's assault on the world of EVs, the fifth battery-electric model from the German carmaker in just two years.

Mercedes-Benz eVito

- Tourer Delivery van
- \$89.353

▶ 262km

- BMW i4 Medium sedan
- \$99,900 • 465km

Genesis GV60

- Medium SUV
- \$103,700 • 466km
- BMW iX3
- Medium SUV
- \$114,900 • 440km

OVER \$120,000

Brimming with technology and performance, these highend electric vehicles showcase what the future of motoring looks like, today.

Genesis Electrified GV70

Genesis Electrified G80

Mercedes-Benz EQC Medium SUV

\$122,724 • 434km

Medium SUV

\$127,800

• 445km

BMW iX

\$135,900

▶ 420km

Large SUV

Large sedan

Jaguar I-Pace

Large SUV

Audi E-Tron

Large SUV

Porsche Taycan

It should come as little

decided to build an electric

car, it would build one with

to the brand's DNA

surprise that when Porsche

the kind of performance true

from first glance. In its most

basic form, the Taycan can

seconds while the range-

topping Turbo S takes an

astonishing 2.8 seconds.

Mercedes-AMG EQS53

Audi E-Tron GT

Large sedan

Large sedan

Large sedan

\$328,400

▶ 587km

\$297,900

🕨 625km

\$181,700

• 488km

BMW i7

hustle from 0-100km/h in 5 %

Worthy of the Porsche badge.

The Porsche Taycan wows

Large sedan

\$158,100

• 403km

\$147,400

• 413km

\$146,857

• 446km

\$145,000

▶ 520km





2008 Tesla Roadster: 53kWh battery 390km rang 2010 Nissan Leaf launched 2011 First Plug-In Hybrid (PHEV) -Chevrolet (Holden) Volt 2012 Tesla Model Slaunched 2013 BMW i3 launched 2016 World's best-selling EV. Tesla Model 3 launched 2018 Volkswagen I.D.R sets new record for Pikes Peak Hill Climb 2020 Global EV sales top 10 million



Battery technology takes off n 1992, a lithium-ion battery cost the present day equivalent of \$20,500

For context, storage in your computer

costs about \$2 per MB (megabyte).

At that rate, a 128GB iPhone would

Today, battery prices are less than \$150 per kWh and data costs less thar

in a Hyundai Kona, \$1.3 million.

Over the next few years, battery

cost \$262.000 and the 64kWh battery

2021



2021 More than 1 million Tesla Model 3s sold

Coming soon: an onslaught of new electric cars

when it arrives sometime in 2023. With its cutesy styling and no frills approach, the Good Cat, which hails from China could do something no other electric car in Australia has done before, come in with a price tag under \$40.000



LDV eT60

Dual-cab ute November 2022

> 330km Despite some

suggestions a few years back from certain sections of the political arena that electric vehicles were coming to steal your utes and weekends, the first battery-electric dual-cab will go on sale next month.

Hailing from Chinese brand LDV, the eT60 will land in Australia with a driving range of around 330km and a price tag anticipated to be somewhere between \$70,000-\$75,000, LDV already has a strong presence, with its regular diesel T60 dual-cab ute a

popular choice for budgetconscious buvers.



MG4 Hatchback

First half of 2023 350km-400km MG already owns the mantle of having Australia's most affordable electric car. But its citvsized MG4 hatchback could undercut its own ZS EV SUV on price when it lands here next year. MG isn't saying how much the MG4 will cost but has revealed that buyers can expect a range of 350km at its most



Toyota BZ4X Medium SUV

affordable level.

2023

🕨 470km-516km The world's biggest carmaker has been

The alternative to alternative fuels

outique carmaker -Lightvear in the Netherlands - has greenlit production of a solar-powered car, although with a price tag close to \$400.000, the Lightvear Zero (pictured below) isn't for everyone. Motivation still comes

from a battery sending power to electric motors b the addition of five-square metres of solar panels covering the roof, bonnet and rear top-up the battery. Its Dutch makers claims the Lightyear Zero can theoretically be driven for

months without ever charging the battery via an external power source. Lightyear is also working on a more affordable model said to be priced at around \$45,000 It's slated to go into production in 2025

SAY HI TO HYDROGEN

Much like the principle behind nuclear-powered cars, fuel cell vehicles carry their power source with them and convert hydrogen to electricity (think of it as a tiny power station inside the



dragged, somewhat reluctantly it seems, into the world of full batteryelectric vehicles. But, the company that pioneered hybrid vehicles has taken the plunge and its first fully electric vehicle in Australia, a RAV4-like medium SUV, is expected here next year.



Volkswagen ID.4

The German carmaker range of EVs but that is set to change from next year. The first of three promised \$65,000.

beginning in 2024.

car) which is fed into a small battery battery. That battery then

powers electric motors which, in turn, drive the wheels

The only tailpipe emission from a hydrogen car is water and, unlike EVs which can take a long time to charge, refuelling a hydrogen vehicle via a specialised high-pressure pump takes just minutes.

Hyundai and Toyota both have hydrogen cars in Australia but sales are limited, Instead, a small fleet is being trialled by various official bodies, including the ACT government in Canberra. It's expected hydrogen

cars will be made available to the general public within two or three years according to Toyota, maker of the hydrogenpowered Mirai sedan.

echnology and cost will only improve.

What's it like to live with?

Rob Margeit

\$0.05 per GB.

per kWh

Mark Butterworth has been electric car owner for five months, taking delivery of his Polestar 2 in May.

The Melbourne-based procurement officer for toy giant Lego has already driven over 7000km and says he opted for the Polestar, the EV offshoot of Volvo, for its modern styling and because of its Volvo DNA.

Mark's Polestar 2 is the Long Range Single Motor variant. With a 78kWh battery, it has a driving range of around 540km.

To help keep his Polestar charged and ready to go, Mark paid around \$1800 to have a Wallbox installed at his home. The Wallbox itself cost around \$1200 with installation a further \$600. That outlay sees charging times from 0-80 per cent reduced from around 24 hours with a regular wall socket to around five to six hours, according to Mark.

Mark's house is solar-powered, and that means he can charge his Polestar during the day to offset some of the costs.

"We've had a solar system on the property now for the last seven or eight years, a small one," says Mark. "If I can configure the charging through the day, then hopefully we'll have a zero cost going forward."

Mark works from home and has the flexibility of charging the car throughout the day. But, when it's not possible to use his home charging set-up, Mark sometimes finds himself needing to use public char-



Mark opted for a Polestar for its Volvo DNA. Photo: Ted Airey

gers. That can, at times, prove challenging, he admits. "Don't get yourself in a position where 'I've got a charge here or else I'm gone'," he says, adding that planning your trip in an electric car is critical, more so on longer journeys.

"I've said this to people. The vehicle, [it's a] smartphone on wheels. The technology in it is brilliant," he says. "But, also you do need your smartphone. It's critical. All of the charging networks, have their various apps. That helps you understand, firstly, where they are, but also what their availability is."

Mark admits that as good as today's electric cars are, they are still not for everyone, urging anyone considering an EV as their next automotive purchase to assess what their driving needs are.

"I think you've really got to look at what driving you're doing. "Ultimately, if you're doing a lot of longhaul driving, then EVs aren't necessarily there at this stage, be it for battery capacity [or] the network in terms of charging.

Utes here to save your weekend

Sam Purcell

The electrification of Australia's vehicle fleet – including our beloved four-wheel drives, utes and SUVs became a defining moment of the 2019 federal election, when then prime minister Scott Morrison famously said electric vehicles will "end the weekend"

tow your trailer. It's not going to tow drive. Electric motors produce 100 your boat. It's not going to get you per cent of their available torque at a out to your favourite camping spot with your family.'

This is incorrect, although there are some important considerations to make when utes and SUVs become electrified.

Australia's first electric ute, due here in November, is the LDV eT60, a rear-wheel drive dual-cab with a range of 325km from a single charge. The US provides a clearer glimpse into the future of electric utes, where a number of models from various manufacturers are already on sale. The Ford F-150 pick-up truck – the highest-selling vehicle of any kind in the US - has an electric variant called the Lightning.

There's also the R1T ute from EV start-up Rivian, while the Hummer brand, once known for its big, burly, gas-guzzling SUVs, has returned as an electric model under the GMC.

Then there's the long-delayed Tesla Cybertruck, the fantastically styled electric ute scheduled to reach production in 2023.

There are many advantages to be Morrison added: "It's not going to had with an electric four-wheel standstill, which is perfect for towing and four-wheel driving.

It's possible to employ one electric motor at each wheel, which can be individually controlled for improved traction over rough terrain and can allow for tricks like a tank turn (spinning around on the spot).

But there are also negatives to consider.

Batteries are inherently heavy, meaning EVs have a relatively high kerb weight compared with their petrol-powered cousins.

That hasn't deterred buyers: Ford currently holds reservations for more than 200,000 F-150 Lightnings, pushing deliveries out to 2024.

Medium SUV > 2023-2024 470km-550km

isn't new to electric cars, its 'ID' range of EVs leading the charge in many European markets. Australia hasn't been a priority for Volkswagen's models, the ID.4 medium SUV range will likely to be priced around \$55,000 to

The ID.4 will be followed by the ID.3 and ID.5 (sensing a pattern here?)

JJIVE

Busting some EV myths

Charging an EV is free While there are certainly some public charging stations, such as those in shopping centres, that allow you to top up the battery of your electric car at no cost, the reality is most public chargers require payment, usually via an app.

You can charge an EV off a regular household socket overnight

Using a plain old wall socket in your home to recharge your electric car can take an eternity, depending on how much charge you need and the size of your battery. Replenishing your battery



from 0 to 100 per cent can take up to 24 hours, or even longer, on a regular household socket.

The better solution is to stump for a dedicated EV home charger. which can reduce home charging to around eight hours. A lot more palatable

You never have to service an EV Electric cars don't have an engine. so it's reasonable to assume your shinv new EV won't need servicing. But there are still plenty of moving parts that require periodic maintenance, such as the wheels and brakes, to help keep your EV in tip-top shape. And consumables such as cabin filters and windscreen wiper blades will also need replacement from time to time.

Charging your EV using the electricity grid creates more pollution than driving a car with an engine

This one is patently false. While it's true the majority of Australia's

electricity comes via either coal- or gas-fired power stations, a batteryelectric vehicle will still be responsible for only half the emissions of a petrol- or dieselpowered car.

Research conducted by PricewaterhouseCoopers Consulting revealed a batteryelectric vehicle charged off Australia's fossil-fuel dense electricity grid is responsible for 98g of CO2 per kilometre travelled. That's around half of the emissions of an equivalent car with an internal combustion engine, which is responsible for about 185g CO2/km.

EV batteries can't be recycled

Another fallacy. The reality is that about 90 per cent and as much as 98 per cent of an electric car's battery can be recycled. While extracting and separating

the heavy metals inside an EV battery is a costly exercise, it's also a worthwhile one, the harvested lithium, nickel cobalt, manganese and graphite reused to make new batteries

And it's not just the precious heavy metals that are recycled. with many of the materials used in the manufacture of electric car batteries - copper, steel, aluminium and plastic - finding their way back into the manufacturing ecosystem.

Electric car batteries deteriorate rapidly over time

Yes, electric vehicle batteries – like batteries in general – will lose some of their ability to maintain charge over a period of time. But, the reduction in battery life might not be as dramatic as you think. Research by Canadian EV fleet

management company, Geotab, studied 21 different EV models and 6300 individual vehicles over a period of five years and found that on average, battery life degraded by just 2.3 per cent per each year. For an EV with a range of 330km, that translates to a reduction in driving range of 7.6km per year. The study found that over five years, battery degradation runs to a smidge over 10 per cent in total (10.1), or in terms of range, 33km.



How your vehicle expends its energy

Rob Margeit

When it comes to using energy to provide motivation in cars, a battery-electric vehicle comes up trumps over one powered by a petrol or diesel engine

Research conducted by Yale Climate Connection, an initiative of Yale University, found that 65 to 69 per cent of the energy generated by an EV is used to actually propel the car, the remaining 31-35 per cent lost to various other functions. These include a loss of 10 per cent in the act of charging the battery itself, a further 18 per cent to the drivetrain components, while heating and cooling the cabin accounts for a further 4 per cent

But, EVs also recoup energy via regenerative braking, feeding as much as 22 per cent back into the system, according to Yale's research, giving EVs an overall energy efficiency of between 87 and 91 per cent in total, meaning that the overwhelming bulk of the energy expended by the vehicle's

22%

EVs also recoup energy via regenerative braking, feeding as much as 22 per cent back into the system meaning that the overwhelming bulk of the energy expended by the vehicle's battery is actually used to propel the car.

battery is actually used to propel the car.

Compare that with just 20 per cent for petrol- or diesel-powered cars, where a whopping 80 per cent of the energy created by burning fuel goes to something other than actually moving the car. Worse still, the bulk of that 80 per cent is actually wasted energy, falling victim to the laws of thermodynamics. Heat loss, in other words.

The very act of burning a liquid to ultimately turn the wheels generates heat through every step of the process. And heat, in this context, is wasted energy.

Ironically, some of the energy

Batteries get a second, somewhat slower, life

Rob Margeit

A common misconception about EVs is that once the battery has outlived its useful life powering your car, it becomes little more than scrap, consigned to landfill.

However, not only can up to 98 per cent of an EV battery be recycled and turned into new batteries for electric cars (see separate sidebar), it can also be refurbished and put to use as energy storage for household and commercial applications.

Much like the battery in your smartphone, which degrades over time, so too the battery of an EV will reach the end of its working life at some point.

Typically, this happens when the battery reaches about 70-80 per cent of its original capacity. And

while that is no longer enough to be considered viable for an EV, it's more than enough to serve as a method of power storage.

expended is used to help keep the

engine cool - fans, pumps and

exhaust. Friction of mechanical

accounts for about 5 per cent of

lost energy, while auxiliary items

seats, lighting and even the sound

In all, Yale's research has found

generated energy is used to keep

In simple financial terms, for

mere 44¢ goes towards actually

moving the car, the remaining

\$1.76 literally disappearing in a

Applying the same financial

efficiency to EVs, just 20-29¢ of

electric car is used for something

other than propulsion, the bulk of

expenditure going towards what a

every \$2.20 spent charging an

car is actually designed for,

moving from point A to point B.

every litre of petrol costing \$2.20, a

such as climate control, heated

system all rely on the energy

generated by burning fuel to

that just 20 per cent of the

the car moving forward.

function

haze of heat.

radiators cool the engine,

dispersing heat through the

parts, also heat generating,

Most manufacturers of electric cars are looking at alternative ways to repurpose batteries. In Japan, old batteries from a Nissan Leaf EV are now used to provide power to lowenergy applications such as street lights and railway crossings.

In the US, General Motors uses the expired batteries from its Chevrolet Volt to power its back-up data

But it's not just commercial applications that benefit from an EV fitted with rooftop solar panels will need to store energy from the sun, the perfect canvas for a lithium-ion battery enjoying a second life.

OPINION James Ward JJIVE

are ready...but is Australia?

easier one to make.

whisper-quiet motoring.

expanding.

chargers available for you.



centre in Michigan.

battery's second life. Any home



This concept art depicts what your home energy storage system might look like.



So, is Australia ready for electric cars?



You understand the science. You've chosen your car. For all intents and purposes, you

The introduction of electric vehicles has been met with plenty of excitement but also a stack of politicising, buckets of misinformation and a whole lot of confusion. It's new territory for everyone, so maybe now is the time to absorb what you've learnt and just take a beat. After all, Australia is unique. For those living in a capital city, the decision to move to an electric car is an

If you have off-street parking and use a small or medium-sized car to run about town, then a home-charge set-up and any of the current or forthcoming EVs can offer you plenty of effortless and enjoyable

Even if you need to rely on public charging, which we all agree isn't great right now, it's an area we know is

Think of it this way, with the current wait times on many popular electric models, if you order one now, by the time it arrives there should be even more

The cars work well. The technology is constantly improving. And with cars starting from the low \$40,000 range, there

are options within reach for many buyers. But if you don't live in the city or use your car for more than close-quarter urban running, then the opportunities, even if you want to buy one, are a little slimmer.

Our 7.7-million square kilometre landmass presents a unique environment for the future of motoring. Parallels to Europe and even North America aren't always relevant as the vast distances and sparse population centres mean that the current crop of EVs, as advanced as they are, simply don't work in a way that suits all of Australia.

Yes, longer-range cars and adding more charging infrastructure will help, but it will mainly benefit city dwellers heading to regional climes rather than providing a viable pathway for those who live and work on the land.

Simply put, right now electric cars present a choice. A choice that you make, and realistically a choice that doesn't suit every Australian motorist. And that's OK.

This choice means you don't need to buy one and it means no one will take your petrol or diesel car away. Any suggestion to the contrary is straight-up wrong.

Yes, some familiar manufacturers are using the change in emission standards in Europe and the US to restructure to an allelectric line-up, making the future of the electric choice a broader one.

At the same time, other familiar brands are looking to what they can do through even more efficient traditional powertrains, often with the assistance of

mild or full hybrid systems.



The Kia Niro EV is one of the options that would work well for city dwellers.

Electrification presents so many opportunities beyond an emissions position that it can be used to make nearly every vehicle better and smarter, and as we've seen with current hybrids, almost invisible to the user.

We know Toyota is looking at a hybrid LandCruiser that can still make an epic trip across the Simpson Desert, but just run more leanly back in the city.

We know Ford is investigating a hybrid Ranger dual-cab ute that can still tow a big van from Perth to Penrith, but just operate with added efficiency on those long-touring stretches.

This is an exciting time for electric cars. The world of EVs is changing rapidly and while Australia's readiness to embrace electric mobility isn't without its challenges, advancements in technology will make them not only more affordable for the average Australian, but also viable for our unique needs.



Scan the OR code to keep up with the latest developments in the world of electric vehicles on drive.com.au

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M///AMG

*Overseas model shown. Some features shown are options and may not be available locally

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