

What Does ECO Mean?

Travels Across a Covid Era Continent in a Hybrid Electric Car

The first traverse - East to West, a trip of approximately 4000km - I saw only one wholly electric car! It was on the back of a tow truck and it was a Tesla. This was in the wee small hours, on moistened Adelaide streets with, it seemed, hardly anyone else or anything around. Adelaide looked fantastic, proper buildings, wide boulevards, a City at its best, an ancient city that didn't need this vehicular interloper. The electric car looked embarrassed to be there.

I am not anti-electric cars, though possibly I do have a bias against Tesla Model S's and above (I'll explain why later). I drive an EV myself, in fact I teach driving in it, and believe I am the first and even after 5 years, the only one to do so in Australia. In addition, every two years, those very same streets of Adelaide, I would normally hope to see strewn with electric cars, though of the solar powered variety, having themselves just bisected the continent in question in the World Solar Challenge race from Darwin to Adelaide. This international event with teams from all over, has this year had to be cancelled, but many teams, like the Aurora Solar Car Team (based in Melbourne), with which I am associated, continue to work on their solar car designs with the aim that the public might one day soon be able to buy such a solar car themselves, and drive North/South or East/West, indeed any direction and for any distance, with an electrically driven car powered by the sun.

The purpose for making my particular trip is to see my father in his nursing home in Perth. I haven't seen him in-person in over a year. Attempts to fly across from Melbourne for a short visit with my significant other have seen us scuppered by cancelled flights as sporadic Covid cases in Victoria sprang up and Western Australia quickly banned us from entering. Getting the lost flights re-booked/refunded became such a hassle, not to mention the loss of hotel reservations and car hire, that I thought I'd eliminate the airplane travel, bring my own car rather than hire, and, at a push accommodate myself, in the reclined front seat of my car when I needed a rest from driving! So, a few weeks ago I bought a car for this trip, a trip across three States, including the

legendary Nullarbor Plain. And I wanted to do this trip electrically because they're 'eco', right?

The electric car for my day job has an 'eco' button as a drive mode which I get my students to select for their lessons and which as well as delivering the preferred driving dynamics, I also assumed was delivering extra special helpings of 'greenery' and saving the planet even more than what I already felt my little driving school was responsibly doing. In this sense, I somehow assumed 'eco' had meant ecological or even a by-word for the even more pious 'environmental'. But, it's only now with my cross-continent car purchase which also has the 'eco' button that I suspect 'eco' might actually mean 'economic', as in I'm driving around more economically when selected? The car I picked for the trip is a hybrid petrol/electric car and is from the same manufacturer as my all-electric driving school car, indeed the electric motor and associated workings are borrowed from it. But, with a much smaller battery pack, it requires an alternative to that battery stored energy, and that is petrol - running a small internal combustion engine, that puts that energy into the tiny (1.6kWhr) battery - which then powers the electric motor, which in-turn drives the front wheels of the car. So, in this way 'eco' does indeed mean economic as it proposes to give a better fuel economy; there is an 'S' button alternative too, which I thought stood for 'sport', but I now believe to mean 'smart', which obviously I'm not as much as I thought I was! Anyway, the purpose of this somewhat arduous explanation, is to hopefully show how hybrid here means scaling back the 'electrical-ness' of an otherwise all-electric car by replacing battery capacity with an ICE (Internal Combustion Engine) engine. And that with this car, the final drive is still always electric, unlike other hybrid brands that are basically petrol driven cars with some added electrical benefits.

Probably we would all come up with Tesla, if asked to think of an electric car brand, but my cars aren't. They are from the company that has sold the most EV's world-wide, who led the way before Tesla and who on the strength of their pure EV, I sought to buy their hybrid to have the same electric driving experience but with the addition of extreme, indeed infinite driving range. I have driven nearly all of the other electric cars available in this country courtesy of a friend and neighbour who is a motoring journalist, and all the cars drive like and have the appeal of, well, an electric car. If you have let go of

the need for a rumbling V8, can live your life with however you have to charge-up a car rather than fill-it-up, and if you can afford one, then in my opinion, an EV is for you. Tesla took a hammer to the problem of getting you into an electric car -they literally put a tonne of battery into the Model S to give acceptable range and even gave you free charging for life at fast chargers at the company's home base in your town. My 'little-car-that-could' had only 1/3 of the battery weight/capacity but struggled to get you charged with a couple of collaborations with electricity suppliers and the installation of home chargers that did not much more than trickle charge you. And Tesla, famously as they claim without advertising, took credit for the electric car revolution and for new levels of automotive performance. Meanwhile, when not giving driving lessons and switched out of 'eco' I continued to surprise many a 'sporty' petrol car when pulling away next to it and my local council started to install free electric vehicle chargers at a number of locations. Generally in sight of council buildings heavily festooned with solar panels and with a purchase agreement to buy power from a community based wind farm, this was 100% GreenPower. Oh, and did I mention it was free? They didn't advertise that either! And so, five years on and forty thousand km's of driving lessons later, I haven't paid a cent to 'fuel' my EV and the electricity that powered me has come from the cleanest source. Now that's what I call 'ECO' in whatever sense of the word you choose to use it. [*Warning: Tesla drivers might want to skip this section.* Returning to address my bias against the Model 'S', and sad to say and generalising here, but the drivers there of, well not content to just use the free power provided by the Tesla company they started to use other chargers. With the size of the batteries in the S's this meant they often sat occupying the charging spots far longer than other smaller battery cars and generally for a longer time than was considered good EV etiquette and which drivers of other manufacturers EV's, more often than not, respected. (On occasion too, from my experience, the adaptors the Tesla people used to be able to use non-Tesla chargers - after market and not official equipment - blew the fuses in the Council provided chargers and rendered them useless to others). Also, with the sheer physical size of the Tesla, it was actually very hard to park next to it to get a 'snout-in-the-trough', or to borrow a term, a 'fair-shake-of-the-sauce-bottle', and don't get me even started on the Tesla model X which is basically an executive dining table on wheels and even more of an absurdity in an Australian sized parking bay, and probably on the road too. So, no doubt you can sense that this bias, its bordering on pathological, and probably I should

seek counselling for it. But I contrast that to the community of EV drivers that always are friendly and happy to chat, exchange email addresses and generally want to help each other, that I meet at the expanded and ever improving Council provided facilities. These are people that have driven down from the country to visit family in hospital in the City; they're technicians on the road driving 400-500km to service medical equipment or newbies now buying affordable second hand EV's or grey imports like the local mobile dog walker and his EV van. Not one has been a Tesla S driver. A few Tesla Model 3 drivers will now at least make eye contact and display a bit more of that EV etiquette but generally they are aloof and even arrogant].

I have drifted a long way off from the subject of my 'eco' driving trip across a continent (but perhaps not from what is 'eco-logically' friendly or even just friendly?). I am currently not much more than 20 metres away from the Indian Ocean writing this, so as West as I can be whilst driving a car in Australia. I have completed about 4,800km of electric driving since leaving Melbourne, at an economy rate of 4.76 litres per 100km and an average fuel price of \$1.71 per litre. I have driven around and then into a lockdown, fought on compassionate grounds to be able to get regular visits in to see my Dad, and I am having to wait anxiously to see if I can leave for the return trip in a few days with the right approvals to cross and enter different states and even to just endure the driving and the fear of not making it back. My background is as a mechanical engineer and later I added further qualifications in Sustainable Energy, so believe me that to the best of my ability the following figures, whilst approximated, are representatively accurate: with the stated fuel economy in my hybrid car, my trip so far has put 525 kg of CO₂ into the atmosphere. If it had been driven, if it could be driven, in a wholly electric car, like the less unpalatable to me Tesla Model 3 Long Range for example, then if 6 of the 9 charge-ups the car would have required along the way, had been with electricity generated in a coal fired power station, then that trip in the EV car would have been responsible for 540 kg of CO₂ being put into the atmosphere, already more than the hybrid. This is the true meaning of 'eco' whilst driving a hybrid car across a Covid continent. My trip back will commence in a few days, and I'll let you know how sustainable the whole adventure has been.

The CO2 emissions for the theoretical Tesla trip in the comparison above are calculated for 'dirty' Victorian (predominantly coal-fired power station generated) electricity. If an average value for the associated emissions across the three States traversed during the trip is used, even then the CO2 for the Tesla would be 523 kg of CO2, so the same as doing the trip in the hybrid!

Distance travelled: 4,800 km
Hybrid car fuel consumption: 4.76 L/100km
CO2 per litre of fuel burned: 2.3kg/litre**
Therefore, in trip so far,
 $4800/100 \times 4.76 \times 2.3 = 525\text{kg of CO}_2$

Tesla (Model 3, Long Range), Battery Size:
82kWh, Range: 580km
Emissions for generated electricity: 77kg of
CO2 equivalent per 100kWh*
Therefore, if trip were done in Tesla,
 $4800/580 \times 82 / 100 \times 77 = 523\text{kg of CO}_2$

*[VIC: 110kg /100kWh, SA: 50kg /100kWh, WA: 70kg/100kWh, Average: 77kg/100kWh]
(Source: [kWh to CO2 calculator. CO2 emissions per kWh calculator | Powershop](#))

**[Petrol's energy content is 34.2GJ/kL with emission factor of 66.7kg CO2/GJ i.e. CO2 per litre of fuel burned is $34.2/1000 \times 66.7 = 2.28\text{kg/litre}$]
(Source: Department of Industry, Australian National Greenhouse Accounts Factors, Australian Government)

.....Part Two.....

The AM radio reception is patchy across the Nullarbor but as I neared WA in my drive across the continent it was ironic that I could at least catch bits of the broadcast of Geelong thrashing the West Coast Eagles back in Victoria. It was ironic and sickening to also hear, interrupting the sports commentary, that Covid cases had been detected in the community in Perth and that it and the Peel regions of WA were going into lockdown. My heart sank. Until then the driving trip had been my saviour for getting away from such things back in Melbourne, and driving the 4,000 km's, though extreme, was my way of achieving travel freedom and visiting the West, and my Dad, for the first time in over a year. Now I was in the dark again, literally, and as another monster truck road-train loomed in the distance, taking longer to crest the hill, the mass of bright lights lingered long on the horizon emphasising the blackness all around and I felt it was the end of the world and I was driving towards it.

This was the low-light of the first part of my Travels Across a Covid Era Continent in a Hybrid Electric Car. At least travelling in my own personalised form of transport and not flying across on an expensive domestic flight, I could take matters into my own hands and divert away from the declared Red-Zones. And, as it turned out, the diversion south-west from WA's Goldfields region, across golden farmland to land growing grapes and to the tourist town of Margaret River, was one of the driving highlights of the trip. If only all driving between regions could be so, instead of via clogged freeways and commuter traffic as drives out of Melbourne all too often are. The other driving highlight was not long after that darkest hour. I had driven on after resting in my car at the Nullarbor Roadhouse, the gloom and other worldliness of the situation this time enhanced by a thick mist on the roads - something I hadn't expected away from my usual driving - but in a sense it was the blanket, literally, that enshrouded me and with and through which I tentatively carried on, until, yep you guessed it, a new dawn. Literally.

The particular dawn in question, broke over the Eucla Escarpment. And with the sun rising behind me, the Plain below was cast in a beautiful light. There was none of that 'end-of-the-world' despair from 12hrs earlier and all ahead seemed to offer hope. It was some sort of revelation I guess? However, for me revelations tend to be the beginning of one hair-brained idea or another, and this was no exception. On this occasion, it was how to build a new sort of city here in this emptiness, one without ugliness, immune, isolated, one with electric cars, even electric planes. With hydrogen trucks and with pumped hydro power from the near-by Australian Bight, pumping on the ever-reliable tide up the Eucla Escarpment to flow back down later and power this new city. Semi-submerged hothouses covered with PV roofs converting some of the water from salt to fresh, to hydrogen and oxygen, and a bulk shipping terminal, with best practices for the elimination of all pollution - noise, smells and CO2 - shipping this new, clean green fuel, off to a waiting World..... I must get on to the likes of Bill Gates, busy buying up huge tracts of similar emptiness in his home country, to get this off the ground I thought. But Bill's got a divorce to deal with now, so no, maybe not Bill for a while. Maybe Elon then, he's got a dog in this fight hasn't he?. But no, he's more interested in escaping to another World rather than saving this one? Anyway, hair-brained or not, as I drove into that day I knew I felt happy, happy my little hybrid car had made it through, happy it was just a normal little car, not some greasy gas guzzler belching out clouds of CO2 or particulates, and happy I felt light and free and wasn't towing a small house behind me.

At Border Town earlier, still in those dark times, I had waited a little while observing some of those crossing into WA and completing the Covid and quarantine checks. I had to wait in the car as the air outside was thick with fumes and it was actually difficult to breath - I presume largely due to a combination of the generators that have to run all the time to power the whole complex of border facilities and roadhouse, and also due to a large number of the huge road-trains, not actually crossing the border, but idling and lined-up like some Mad Max prelude, that were also no doubt contributing to the general fug. With the Mad Max 'air' of the place, the bulk of the other vehicles crossing fitted in well. There were the aged and battered four-wheel-drives, a few bombie station wagons and a variety of towed appliances ranging from the be-chintzed favoured mobile home-away-from-home of a certain tone of nomad, to trailers carting the whole home or at least all worldly possessions of some travellers, to fully prepped 'preppers' assault vehicles

with ever aggressive brand names. Only a new two-tone (red and black) smaller model RangeRover stood out to me - the drivers: a female couple, casually blipped their remotes as they idled in, and could've been on the local run for their soy lattes, rather than crossing a continent. Unencumbered by trailer and still in their cool inner-City attire, they seemed the most at ease at forging this milestone and I knew it was they I envied and that's how I would choose to travel - (perhaps with the addition of the latest and trendiest, pop-up 'old-school' canvas stand-up tent, if I really had to lie-down and sleep somewhere that was box-shaped and that I'd brought from home) - AND if it were the case that their way cooler and probably, it has to be said, more comfortable vehicle, was as 'eco' as my little hybrid?

Excess weight is generally a sign of over-consumption, in humans and in engineering too. Where I was born in the UK, a local hero is Isambard Kingdom Brunel who built such ships as the Leviathan, which, as its name suggests, was neither small nor lightweight! It's ilk, together with steam trains, the other engineering marvel of that time, were the monster-trucks of the day. Both ran on copious amounts of coal, a fuel which operators of those two modes of transport would have had no concept of being a finite resource, or unfortunately, the instigator of our climate crisis now. A few industrial revolutions down the track, it is generally accepted, that light weight in design, usually produces a more efficient result and less consumption of whatever resource fuels these creations and that we know, continue to affect our World's climate. So, divergence from these more svelte trends, would, you would think, stand out as obvious bad practice. Tesla's cars blatantly disregard this trend. And now, I have just realised, the root of my bias against them, is the fact that the last internal combustion car I sold - had to sell to pay for my first EV and the car that was my first true automotive love - was a super-lightweight, minimalist in design and materials, fast (enough), two seat Sportster, that I know personally Elon took from a slim and very respectable 795kg mass to 1,305kg with the inclusion of over 6,800 lithium-ion batteries. Now that is over-consumption into the 1000's/without any regard for a finite resource. No wonder he shot the car off into space! And with subsequent models, 'S', 'X', and even still with the Model 3, that ratio of doubling what is a respectable weight and what would be normal for that car segment (and at the same time tripling the purchase price as well!), he continues to over-indulge in his use of the finite lithium resource and create a need for the 'fuel', whilst at the same time trying to acquire an influence in or outright ownership of any

lithium mine he can get his hands on. It's not necessarily sinister but, without strong evidence that there is any meaningful recycling of lithium out there, which there isn't, it is surely irresponsible at the least? The same can be said for the other elements: nickel, manganese and cobalt, which are also a key component of these ever-burgeoning battery packs. Of course, Tesla aren't the only vehicle manufacturer out there to produce big-batteryed solutions to the EV conundrum of acceptable range. All the manufacturers do it to a varying degree, balancing the range (and battery size), against purchase price. But as more EV's become available and we are told the economies of scale will bring down that price, that inevitably means the use of much, much more lithium (a limited resource that will always pollute in its extraction and which isn't being successfully recycled). And I'm no economist but isn't it pretty basic economics that increasing demand on a limited resource, well doesn't that lead to all sorts of problems? Petroleum anyone??

I began writing this account of my travels just as a way of recording the petrol consumption and then as a document to prove I'd made it in, by what would be most peoples standards, a slightly unusual car for the task. As I have already converted to electric driving in my day-to-day driving and for work, I wanted to do this cross-continent trip as electrically as I could. I certainly didn't want to do it in a big, mechanically prone, particulate and CO2 spewing, behemoth, with a trailer in tow for added inconvenience. And then there was Covid and also my feelings on the EV market as it stood in this country. I have talked above about the matter of big batteries creating a new resource war, and this is particularly galling for me given my involvement with solar powered cars. Solar cars do make use of lithium batteries but these are generally closer to the size of that in my hybrid car. The electricity for the vehicles comes straight from the photo-voltaic cells on the vehicle itself, directly from the sun above (and not from any power station), and the PV cells, which are silicon, are made from silica sands, which are more than abundant and not difficult to mine, and which can be created, in an admittedly energy intensive process which is CO2 prone, but fuelled by PV power itself, in huge mega-factories, where economies of scale really can do their bit. This is where Tesla actually does score points with me and people will be aware, no doubt, of such vast factories, in particularly sunny climes elsewhere in the world. Unfortunately, Australia, the sunniest continent, can't yet boast of such facilities, even though

world leading technologies and world record efficiencies for solar cells were made here first by Prof. Martin Green at UNSW. Sadly, we're pretty well endowed with the sands required too, so it is doubly frustrating. I am not proposing that we ban all current EV's until we can offer a solar EV alternative, but I am suggesting, and trying to demonstrate, that there are more appropriate ways to use the current EV's that we have, and that at times, it makes a lot of sense, to (re-)introduce, a hybrid element to the equation, and reduce the amount of battery resources being used. For example, my driving instructor car doesn't have anywhere near the range of the current batch of EV's available from all manufacturers but doing 100km of driving lessons in the local area where I live, is enough for anyone in one day. And I responsibly, and respectfully (!), re-charge my quite small battery at a GreenPower local council provided facility that does not rely on coal-fired power generation. My other car - a hybrid - has just successfully crossed our sunny continent and did not miss a beat. The electric 'driving-ness' of my particular style of hybrid, helped make the driving pleasant and safer: one-foot driving, where lifting off the throttle also actively brakes an EV car, is quite a good thing to have, I realised when barrelling along at 110kph and entering an outback bend on a narrow road, possibly in the wet, where delicate yet instant braking is required. This process - regenerative braking - also puts energy back into the battery, so win-win all around. (It also, reduces brake pad wear, saves tyres, stops brake heat build-up and brake fade.....etc, etc!!). Also, the smaller size of my particular hybrid car and it's responsive driving despite having a lot less power than, say, that RangeRover I eyed-up earlier, made passing VERY long road trains - also barrelling along to the best of their ability - a breeze. I never once felt I had to wring the guts out of my car to pass such a road train and avoid the slightly sweaty pants feeling. In fact, I felt surprised each time how quickly the manoeuvre was over and had to reign in the whole process to not get too far ahead of myself. (Though it was quite satisfying to do this to a 4WD Porsche-pulling-caravan combo, a completely ridiculous set-up by anyone's standards!! N.b. I have since noticed they do a hybrid version of this particular vehicle and I am willing to repeat the cross-continent drive in it for comparisons with my less ridiculous little hybrid if required!!?).

So, writing now, I am back in Melbourne - the return trip from Perth was without incident, either COVID-wise or vehicular-wise. In fact, much more of

the return trip, it felt, was in that optimistic, untarnished, early morning clearness of sight and mind. Even the 'Mad-Max' border station revealed it did actually have maybe two-dozen PV panels and a couple of garden sized wind turbines helping to power the place and that without that fug of the road-train emissions, it felt a much less daunting place. I even lapsed into tourist mode a couple of times on the return trip. At the Eucla Roadhouse, I got out on foot and closer to sea level and the totally uplifting, inspiring and liberating presence of the Great Australian Bight and the World beyond and I vowed to return there with a couple of my hair-brained ideas better realised. As far as the joy of driving, after one of those inspirational early morning starts from Port Augusta in South Australia - literally awesome in it's early morning stillness and combination of bays and mountains - the drive from there via the Goyder Highway to Victoria's Riverina region, definitely satisfied my ex-petrol-head driving needs, switching my hybrid, on one of the rare occasions, out of both 'eco' and 'smart' and leaving it in just pure fun, which is what I certainly had. (It was a huge coincidence that driving that part I chanced upon a couple of stages of the S.A. rally championships happening in paddocks and on tracks right alongside where I was driving my hybrid. It made it kind of alright that these high-performance vehicles and drivers of the internal combustion world, some classic vehicles from decades before, were really enjoying barrelling along too, in vehicles tweaked over those years, to being the most suited to the demanding task at hand. If the cars were only used for that purpose and not approaching anything like providing our daily driving needs, then doesn't this make it a responsible and acceptable use of resources (petrol) and of limiting emissions? It also helped, and I was perhaps seduced by, the sweet sound of those engineering marvels working wonderfully and raucously, an area I concede my hybrid's car cannot aurally compete in).

The total distance driven to complete both legs of the trip, came to 8534km. Doing this in my hybrid electric car and requiring a total of 419 litres of petrol to do so, put 955kg of CO₂ into the atmosphere. If a theoretical trip in a non-hybrid, fully electric, battery EV, was completed in such a vehicle as the Tesla Model 3 Long Range, then (again using an average of the emissions for electric power generation across the three States), 929kg of CO₂ would be added to the atmosphere - the effect of both therefore, is virtually the same. However, the Tesla trip is theoretical, and it is very unlikely that anyone would actually

except the challenge to do it!? This is because range anxiety will likely be a much greater deterrent out in the 1000's of kilometres of emptiness like that of the Nullarbor. And even if somewhere could be found to plug-in at acceptable distances apart, it is only likely to be a 240V/10amp outlet with which it is going to take 34hrs continuous charging to replenish one depleted Tesla 82kWh big battery!! This would seriously affect the time to do the Tesla trip, especially considering that 15 complete re-charges would be needed for the whole trip. This incompatibility of the battery EV for the trip because of charging and range limitations is probably no surprise to most people who have even fleetingly considered the idea of switching to one of the many EV's now available on the Australian market. However, possibly the fact that on emissions, the pure EV (a Tesla in our example), would pollute just as much as the hybrid I did the trip in, might not be as evident to those considering a move to electrification of their mode of transport. Even more surprisingly, I would suggest, would be that even without any great cross-continent driving comparison, but just considering the use of each of these vehicles in a city/daily driving scenario, even then the Tesla is the bigger polluter, and by quite some margin.

Distance travelled in a week: 580 km
 Hybrid car fuel consumption: 4.00 L/100km
 CO2 per litre of fuel burned: 2.3kg/litre**
 Therefore, in one weeks,
 $580/100 \times 4.00 \times 2.3 = 53\text{kg of CO}_2$

Tesla (Model 3, Long Range), Battery Size: 82kWh, Range: 580km
 Emissions for generated electricity: 77kg of CO2 equivalent per 100kWh*
 Therefore, one weeks driving in Tesla,
 $580/580 \times 82 / 100 \times 77 = 63\text{kg of CO}_2$

*[VIC: 110kg /100kWh, SA: 50kg /100kWh, WA: 70kg/100kWh, Average: 77kg/100kWh]
 (Source: [kWh to CO2 calculator. CO2 emissions per kWh calculator | Powershop](#))

**[Petrol's energy content is 34.2GJ/kL with emission factor of 66.7kg CO2/GJ i.e. CO2 per litre of fuel burned is $34.2/1000 \times 66.7 = 2.28\text{kg/litre}$]
 (Source: Department of Industry, Australian National Greenhouse Accounts Factors, Australian Government)

The figures presented above are for the average emissions value. So, typically driving in Melbourne, Adelaide or Perth, emissions associated with city driving, will be somewhere around the 63kg of CO₂ for a car like a Tesla when charged with grid electricity. At the same time, my hybrid comes even more into its element with regen, slower speeds and plenty of stop/start being handled by the electric drive, the petrol consumption is very economical. As I drive around the City of Melbourne now, a few weeks after returning from Perth, I am seeing as little as 4 litres of petrol required for every 100km I drive in the City, and it'll likely be nearer to only 3.75 litres which would mean only 50kg of CO₂ for the hybrid car. Whilst, with the 'dirty' coal derived power dominant in Victoria, the Tesla would actually be responsible for 90kg of CO₂! Almost twice as much. Responsible Tesla drivers might tell you that they only charge-up at home, where either they have solar - even the biggest home PV set-up will not be charging at much more than the domestic 10amp240V, so again, thirty hours to recharge, so I don't think so - or at the very least, they have signed up to one of the 'Green' energy plans from their energy retailer and got a faster charging unit installed at home. Perhaps they are just getting all their re-charges, that came with the purchase price of the car (Model 'S' and 'X'), free still from the Tesla main retailer, and which they assumed to be Green - which it most likely isn't!? Actually, what they are doing, I can tell you from personal experience, is clogging up the Council provided facilities that I rely on!! And so it all begins.... big-batteryied Tesla's, overstaying their welcome in overweight cars, without any regard for how irresponsibly they are using resources. For vehicles that cost more or less \$100k, I would be embarrassed that I couldn't make room on my expansive forecourt at home and pay just cents per kWh from any one of the Green electricity retailers, to get my car charged responsibly at home. My EV, which is put to good work in the local area, is 1/3 the price of the Tesla (because its battery is 1/3 the size), and I must park on the street at home, as I'm genuinely inner city, and so can only use public charging facilities. So, you think it doesn't gall me when I rock-up to my local chargers only to find Tesla's hogging them.....again!?

On the surface, more EV's, (more Tesla's most likely), we're led to believe, makes for a cleaner environment. I have showed, by extreme measures, that all across our Continent, and in our Cities too, this isn't actually the case. Tesla cars grab the head-lines, with their 'ludicrous' speeds and their 'no-advertising'

advertising (which is actually them NOT telling us anything of the realities of the car), whilst in the meantime, the car driving masses are part of a different reality. That is, despite appearances to me that everyone these days seems to drive an oversized +\$50k SUV or expensive German auto, I think the silent majority are probably still more likely to be driving a medium to small sedan or hatch, increasingly from Japan or Korea as Holdens and Fords do their death rattle here. Often, I would say, these are second hand vehicles, and whilst some smart shoppers are deliberately targeting the used car market of those hybrid vehicles that are out there, again, my observations are that the masses, will, most likely, be found driving slightly ageing and 'old-tech' internal combustion engined petrol cars, or worse still, those diesels, so many of which we were lied to about in regard to their emissions. *[And even more incredulous, in a country (Australia), where NO emissions tests are required for the on-going use of these aging cars - that, in itself would be unbelievable in countries elsewhere in the world!]*. Fuel consumption of these cars, that are the true reality out there, are generally going to be at least twice that of my little hybrid (and so twice the emissions too), rapidly increasing to 3 and even 4 times the consumption as the age of the vehicles and/or its inappropriateness for the daily drive increases. For example, do you really need to be racing so quickly to speeds above the legal limit, or have such a big V8 engine so one or two weekends a year you can tow something you hardly use to a location you're going to pollute!? Tread lightly people and not so fast.

I am impressed by the savvy shoppers getting good buys on the second-hand hybrid market and there is even a home-grown industry for replacing the small battery packs associated with these hybrids. So, you might think I'd extend that to buying second hand EV's too? Well, my small battery EV, if you want to buy it second-hand and bring it up to its original range capabilities with a new battery, then that battery will cost you \$10k. That is probably acceptable, given what the second hand cars sell for and how little maintenance and repair costs would need to be spent on the rest of the vehicle over the rest of its life. If you are buying a Tesla, or any big-batteryied EV on the second hand market, firstly, that initial second hand price is still going to be at least three times the small battery car, and either you are going to pay an as yet unspecified price for the new battery pack when required - remember it is made from a diminishing resource with increasing demand - but likely to be three times the smaller battery's price, or, you are going to be responsible at some point down the track for paying for the disposal (as recycling not an option), of the BIG battery

as the vehicle eventually dies like an ageing mobile phone or ipad. None of this will be cheap and doesn't sound like a convincing argument for getting the masses into what we're told is the new, more environmentally friendly driving option, which actually I've shown, isn't really the best 'eco' or environmentally friendly option at all! I am all in favour of subsidies that lead us as a nation to greener behaviours and reduce our carbon footprint. And subsidies obviously have the greatest benefit when they can be applied to the greatest number of cases. Rooftop solar rebates and grants apply largely to the masses, EV car subsidies will apply largely to richer parts of society, those who can afford the very high purchase price of an EV and not to the masses at all - plus, there is no guarantee the deep pocketed EV owner will be bothered to always charge with GreenPower. By comparison, the new price of the hybrid car that is the subject of this study, ought to be much more acceptable to the general car buying public - I bought it as a 'grey import' from Japan and three years old it cost \$23k - and, if a subsidy on this hybrid's new purchase price of say \$5k were applied, it would be attainable by a lot of people and then the more and more people that drove this sort of car, then the emissions savings are built-in (no guarantees in charging or 'fuelling' behaviour needed) and the closer and closer we would get to halving our petrol usage and our reliance on this diminishing resource and therefore halving the emissions associated with the cars on our roads. Wholly electric cars are seen as the much more 'eco' option for achieving these emissions reductions because they don't burn petrol, but, if only the rich can buy these cars and they are re-charging them with dirty electricity, the change for good, will actually be non-existent. So, 'What Does 'Eco' really mean?

My Covid era travels have made me re-think how I crossed a continent. I was happy to forego air travel and do the trip in my own little enclosed space. Public transport in the cities seems to be going the same way. And, despite the fact that prior to embarking on this cross-continent trip I had been happily driving in the City for 5 years in a wholly electric car, I have returned from this mammoth adventure to not only say that the best car for that trip is a small, somewhat insignificant, electric hybrid, but that if ultimately, we judge this suitability on the grounds of how effectively and to what extent our transport choices reduce our overall CO2 emissions, then that hybrid, is also the choice for our daily drive in the City too. The upshot, and my feeling now is, that

whatever we do to enable more people to drive non-polluting electric cars, the more we're actually doing to assist a wealthy few to drive their expensive playthings. It sounds harsh, and I sincerely apologise to particular individuals that I called out earlier, part of the better EV community I am pleased to have met during my EV journey, but in the majority of cases, new EV's are being bought by wealthy people that either don't appreciate, or just flagrantly ignore, how they are consuming excessive resources (lithium battery), and/or making inappropriate use of public charging facilities, and that how they will likely have to use them is actually polluting more than a more appropriate for the task and more affordable to more people, hybrid electric car! But perhaps the biggest irony and maybe the battle I should be facing, is the fact that the particular hybrid car I am championing throughout this whole trip - I'm not giving the manufacturer free advertising by naming them as I'm suspicious of their reasoning - well, that car isn't actually available to buy in Australia!! As a grey import, it qualifies on the grounds that it is in the 'Environmental' category, and in its home market, it is actually the biggest selling car in 2 of the last 3 years. So, it's merits are definitely known. But why it wouldn't be sold here, and why the benefits that it could wreak on this country's emissions, can't be realised, remains a mystery to me. My suspicions are that, unfortunately, Australia is actually targeted as a 'dumping-ground' for old-tech consumer items, cars not being the least, and larger populations elsewhere offer greater profit potential for new products and our smaller population, isolation and lax emissions laws, mean we can more easily be palmed-off with old-tech and end-of-the-line products. Whether the government here should actually look a little deeper into what vehicles it might consider subsidising, or indeed, what sort of EV it allows to proliferate, if it is serious about significantly reducing transport emissions; or, if it should perhaps, at least in my 'hair-brained' world, help develop a mass market car for Australian conditions, using Australian resources and truly GreenPower - solar car anyone!? Then, at any rate, I don't think that the EV market (in terms of both sales and charging behaviour), can be left to develop under market forces alone without someone in control that has a better understanding of what any sort of travels in an electric, (or hybrid) car, truly means.

The Author is currently working on the design of an all Australian solar EV for use on the road (and all across the continent) using electric motors, controllers and solar trackers and other items designed and made here and emanating from success in the World Solar Challenge race from Darwin to Adelaide. Anyone wishing to assist in this endeavour should contact john.eeezzz.63@gmail.com