GENERAL ISSUES

Note to readers: Blue underlined links connect to trustworthy references and sources if you want to check the veracity of the statements.

QUESTION: The old, old question - Why fix it when it isn't broken?

On Thursday 8th September 2022, the new Australian Government ratified a legislated carbon emissions reduction target of a minimum of 43% reduction over a baseline of emissions as they stood in 2005 by 2030. This law and it associated policies, will have wide ranging impacts on every aspect of society including the transport and passenger vehicle sectors.

This new law is in addition to a previous October 2021 Morrison Government commitment to the internationally binding 2016 Paris Agreement that mandates no net carbon emissions by 2050.

Every Australian State and Territory also have their own legislated commitments to net zero carbon by 2050.

Most Local Governments also have such commitments. The reason all levels of Government in Australia and countless companies have made such commitments is effectively because the climatic patterns on earth actually are indeed 'broken' compared to historic patterns as we know them.

While Australia has always been 'a land of flooding rains, droughts and fires', climate change is making these events more frequent and more extreme in Australia and globally. A recent study of over 400 peer reviewed scientific papers showed 71% of 504 extreme weather events and trends globally were found to be made more likely or more severe by human-caused climate change.

The increased emissions of natural climate altering gases since the beginning of the Industrial Age such as carbon dioxide ($CO_{2)}$, methane (CH_4), nitrous oxide (N_2O) due largely to the burning of fossil fuels and synthetic gases like fluorinated synthetic refrigerants, have had a warming effect on the upper atmosphere that is changing climatic patterns in the lower atmosphere. The increased temperatures in the upper atmosphere result in greater pressure gradients within lower atmosphere climates and result in greater extremes generally, i.e hotter and colder and drier and wetter weather patterns and more extreme rain events, flooding storms, bushfires, droughts and so on.

Each of these gases has different life cycles and climate changing potency. Carbon dioxide has been used as a baseline measure to compare all other gases against. In order to calculate the combined impact of the different greenhouse gas emissions, emission levels are converted into CO_2 equivalents. This conversion is based on the 'Global Warming Potential' (GWP), i.e. the measure of warming that is contributed by each gas to the greenhouse effect.

One kg of 'CO_2 equivalents' (CO_{2e}) equals the effect of one kg of CO_2 being emitted. The emission of 1 kg of nitrous oxide equals 298 kg of CO_{2e}, and the emission of 1 kg of methane is equal to 25 kg of CO_{2e}. The global warming potential (GWP) of fluorinated gases or F-gases vary greatly and can be substantial. For example, 1 kg of sulphur hexafluoride equals 22,000 kg of CO_{2e} and even R134a the common refrigerator and car air conditioning gas has a CO_{2e} of 1370 times.

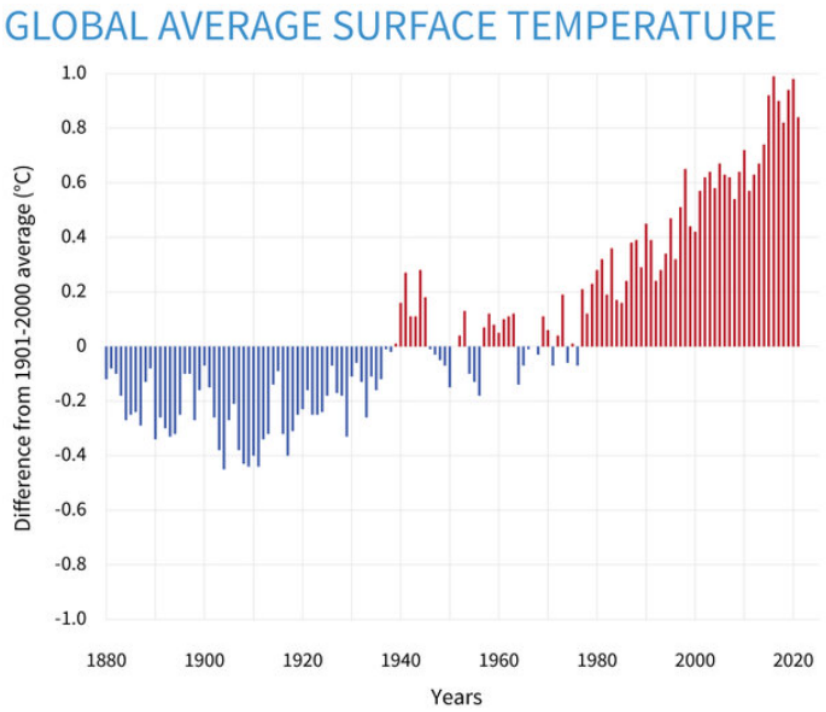
It has a life in the upper atmosphere of 100 years, so every kilogram of CO2 gas emitted now lasts many generations. Methane lasts around 12 years, Nitrous oxide around 110 years and the fluorinated gasses between a few weeks to 25,000 years for sulfur hexafluoride used in electrical switchgear and for various scientific and medical purposes. The pre-industrial atmospheric carbon dioxide level was 340 parts per million (ppm), it is now 421 ppm, 50 percent higher than the

preindustrial average, before we began the widespread burning of oil, gas and coal in the late 19th century

From 1990 to 2019, the total warming effect from greenhouse gases added by humans to the Earth's atmosphere increased by 45 percent. The warming effect associated with carbon dioxide alone increased by 36 percent. Emissions in 2021 totalled 36.3 billion tons, the highest level in history. This year we added another 2 parts per million more than last year's record.

As the amount of carbon dioxide increases, the planet keeps warming, with effects like increased flooding, more extreme heat, drought and worsening wildfires that are already being experienced by many thousands of Australians and millions of people worldwide.

Average global temperatures are now about 1.1 degrees Celsius, or 2 degrees Fahrenheit, higher than in preindustrial times. These are average temperatures though. Some areas like the Arctic have warmed by up to 2.2 degrees Celsius, or 4 degrees Fahrenheit.

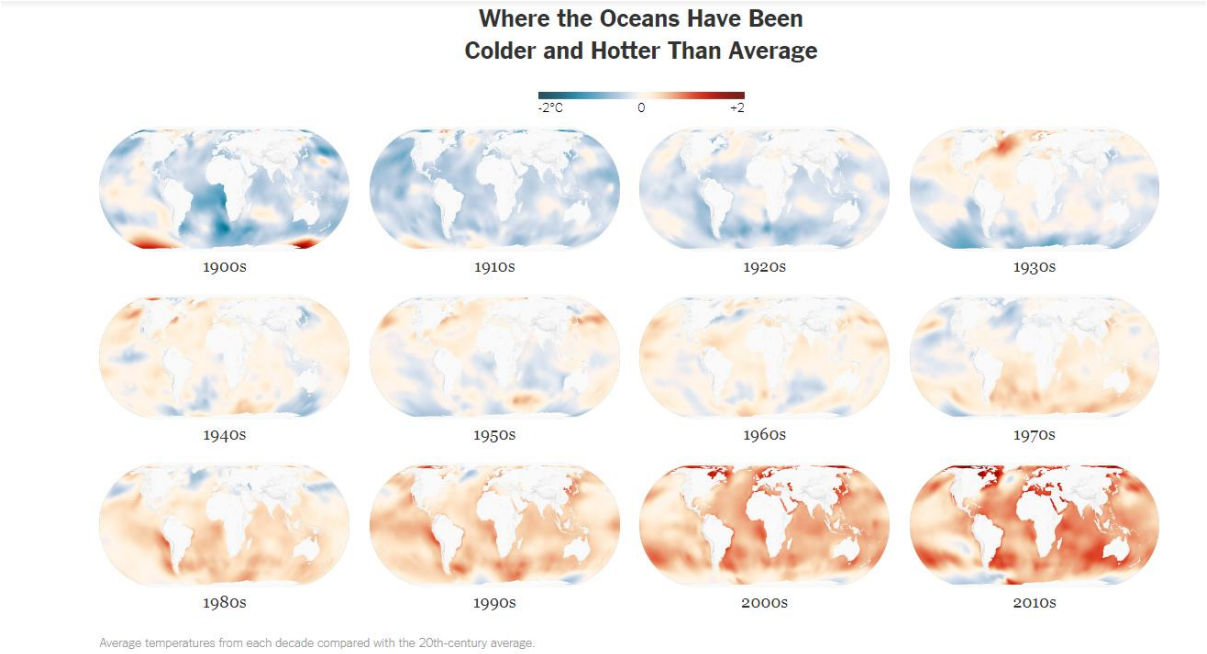


Yearly surface temperature compared to the 20th-century average from 1880–2021. Blue bars indicate cooler-than-average years; red bars show warmer-than-average years. NOAA Climate.gov graph, based on data from the National Centers for Environmental Information.

Surface temperatures actually mask the true scale of climate change, because the ocean has absorbed 90 percent of the heat trapped by greenhouse gases.

Measurements collected over the last six decades by oceanographic expeditions and networks of floating instruments show that every layer of the ocean is warming up.

This is the reason we are experiencing more frequent La Niña events in Australia that are exacerbating rain intensity and duration that has led to the dramatic increase of record-breaking floods over the past few years.



The National Greenhouse Gas Inventory report released in 2020 shows the transport sector represents **18.9%** of Australia's emissions and car emissions represent 47% of that total, or nearly 9% overall.

QUESTION: Australia is so small in the climate equation. One might ask, why are we bothering?

Australia's population at 26 million is only a small fragment of the global population admittedly at around 0.33%.

But Australia's global fossil fuel carbon footprint is larger than usually thought. Whilst Australia's share of global CO2 emissions from fossil fuel is relatively small at about 1.4% of global emissions in 2017, accounting for fossil fuel exports lifts this global footprint to about 5%. Estimates show that in 2017 Australian coal and gas exports produced around 2.9% and 0.6% of global CO2 emissions respectively. If exported emissions were to be included, Australia's carbon footprint would be equivalent to the total emissions of Russia, reaching the fifth position in the ranking of biggest CO2 emitters globally.

On a per capita basis, Australia's carbon footprint is the largest among top emitters, surpassing China by a factor of 9, the US by a factor of 4 and India by a factor of 37. This highlights the importance and responsibility Australia has for global mitigation efforts.

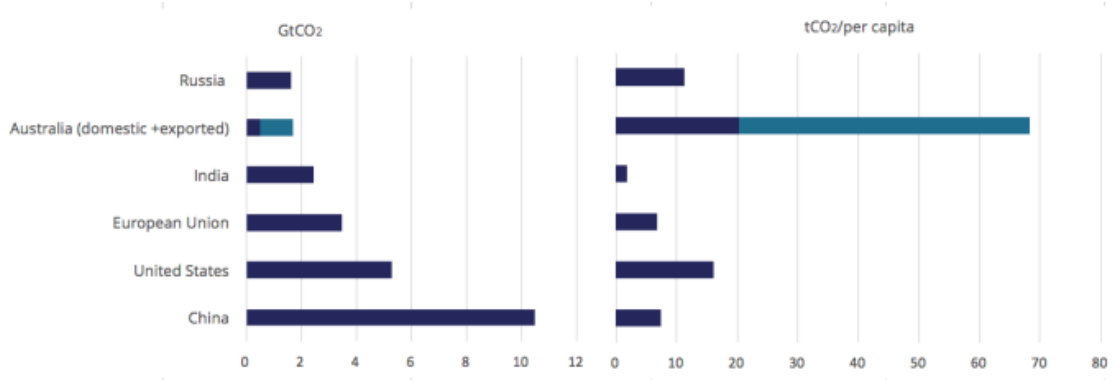


Figure 15 – Main CO_2 emitters 2017 total and per capita (exported emissions added for Australia in light blue). Values in the left panel correspond to $GtCO_2$ and values in the right panel are expressed as tCO_2 per capita.

QUESTION: Have we reached peak oil yet?

Firstly, we need to define what we mean by peak oil. Are we discussion peak demand or peak supply? Let's look at both.

Peak oil demand: The world has already passed "peak oil" demand, according to Carbon Brief analysis of the latest energy outlook from oil major BP.

The 2020 edition of the BP published annual outlook reveals that global oil demand will not regain the levels seen in 2019. It adds that "demand could soon fall rapidly in the face of stronger climate action – by at least 10% this decade and by as much as 50% over the next 20 years". Numerous other sources are saying the same thing. Demand will be decreasing in line with global carbon emission reduction targets. This is a potential long term issue also in relation to supply of fuels needed to supply existing internal combustion engines such as those we all cherish.

Peak oil supply:

How much oil does Earth have? The short answer to this question is that nobody knows. But by any estimation, it is clear that Earth has a finite amount of oil and that global demand is expected to increase. In 2007 the National Petroleum Council, an advisory committee to the U.S. Secretary of Energy, projected that world demand for oil would rise from 86 million barrels per day to as much as 138 million barrels per day in 2030. Yet experts remain divided on whether the world will be able to supply so much oil. Some argue that the world has reached "peak oil"—its peak rate of oil production.

The controversial theory behind this argument draws on studies that show how production from individual oil fields and from oil-producing regions has tended to increase to a point in time and then decrease thereafter. "Peak-oil theory" suggests that once global peak oil has been reached, the rate of oil production in the world will progressively decline, with severe economic consequences to oil-importing countries.

A more widely accepted view is that through the early 21st century at least, production capacity will be limited not by the amount of oil in the ground but by other factors, such as geopolitics, economics and climate change concerns.

A major concern is that a continued supply of oil is increasingly depending on nonconventional sources of oil, such as oil sand reserves, oil shale deposits, or reserves that are found under very deep water (e.g. the USA and Canada are now oil independent largely due to high impact oil sands and shale oil deposits) These non-conventional sources are significantly more expensive to produce than conventional crude oil and produce much higher climate change impacts and environmental damage

including to artesian and surface water resources compared to even conventional well-based oil sources.

QUESTION: The industry needs to develop unbiased and scientifically robust information on the true product life cycle cost & duration of battery technology application in vehicles. Why is this not happening and why aren't the community being adequately informed and communicated to?

As yet Australia does not have an EV manufacturing capability so any information needs to be produced by overseas manufacturers. The Australian Government has effectively, until the last election been actively anti-EV and renewable energy. This changed with the election of the current Government, and we are now seeing massive investment and regulation around reducing carbon emissions to the point where National Vehicle Emissions Targets are being proposed and consultations are now underway with industry.

Whatsmore, there is now plenty of unbiased Government provided information available including the Federal Government's:

Low and zero emission vehicles Guide that includes information on:

- Electric vehicles
- Hybrid vehicles
- Hydrogen vehicles

The Electric Vehicles Council is another reputable source of information on EVs.

The University of Technology Sydney (UTS) is also a reputable source of research that has determined Australia won't meet its climate target of net-zero emissions by 2050 without an overhaul of transport, as the sector accounts for around 17% of national emissions and given that ***passenger cars alone account for around half of all our transport emissions***. UTS cites new research reveals having an electric vehicle would mean less emissions than a fossil-fuelled car – but the extent to which electric vehicles can lower emissions varies in each state. Much depends on how much electricity is generated from renewable sources, such as solar, wind and hydro. A recent survey of nearly 750 Tesla owners showed "..51% of the respondents reported using home solar to charge their EV, and a further 25% reported using green energy/ offsets", thereby reducing the life cycle climate impacts even further.

Australia-wide, the study found electric vehicles emit, on average, 29-41% less emissions than a typical fossil-fuelled car for every kilometre driven and that this reduction increases as the amount of renewable energy used to charge vehicles increases.

Polestar, a brand of EV by Chinese car maker Geely – which owns Volvo, claims it "fastidiously audits its supply chain and publishes an annual life cycle assessment report, which compares its flagship EV Polestar 2 with an equivalent internal-combustion-engine vehicle. Taking manufacturing and 200,000 kilometres of driving into account, the Polestar 2 produces 46 tonnes of carbon dioxide based on emissions figures using the current global average energy mix, compared with 58 for a comparable petrol car. In regions primarily using renewables, the Polestar 2 figure falls to 26 tonnes." In Australia, a country with the highest number of rooftop solar photovoltaic installations in the world, charging an EV from your own rooftop solar is highly practical and means you can run your car for 'almost nothing' and this includes virtually eliminating climate changing carbon dioxide emissions, especially if combined with home battery storage.

Transportenvironment.org is another authoritative albeit European source of the entire LCA performance of electric vehicles that includes the equipment cycle (batteries, powertrain, glider), shows the ***climate change impact of a diesel car amounts to 230% that of an EV***. This assumes cells manufactured outside of Europe with a high carbon electricity source. About a third of the emissions in the EV originate in the production of the vehicle compared to less than 10% for the diesel. But the lifecycle emissions of the diesel are dramatically higher than the EV and hence the difference over the full life of the vehicle, especially as grid carbon intensity decreases over time or home solar is used to power the vehicles.

QUESTION: What percentage of the Australian power grid is renewable currently?

In 2021, renewable energy sources represented 29% of Australia's total electricity generation including solar (12%), wind (10%) and hydro (6%).

Solar and wind have been the primary drivers in more than doubling renewable generation expansion over the last decade. Small-scale solar generation grew 29% in 2021, and by an average of 28% per year over the last 10 years. Wind generation grew 19% in 2021 and by an average of 15% per year over the last decade. Hydro power output been fairly consistent.

Recently, large-scale solar generation has begun rapid expansion, growing from negligible levels before 2016 to 4% of all Australian electricity generation in 2021, and representing a five-year growth rate of 1,747%.

On Friday 28th October 2022, renewable energy generation hit a new record, briefly contributing more than two-thirds (68.7%) of the power in Australia's main grid.

In the final weeks of 2022 South Australia chalked up a world first run of more than 10 consecutive days over which the average production of wind and solar accounted for 100%of local demand for more than 10 days (a total of 249 hours).

The International Energy Agency projects Australia's renewable capacity is set to increase further by nearly 30 GW, or 75%, during the period 2021-2026.

The increasing proportion of renewables in the main grid is one of the reasons EVs are being targeted as a significant way for Australia to reduce climate change inducing emissions from fossil fuels.

QUESTION: It appears to us that the owners of vehicles fitted with ICE engines (such as our classics and other more modern vehicles) may have the choice of three options when petrol and/or diesel are no longer available, namely:

1. Leave the vehicles as per original and they become "museum pieces" that no longer run;
2. Forego originality and pay huge sums of money to convert the vehicle's drivetrain to an electric motor with appropriate drivetrain components and battery storage systems; or

3. Keep the original drivetrain and for a significantly less amount of money, convert the fuel system to run on a gaseous fuel, such as CNG or Hydrogen.

Which of these is more likely?

Maintaining legacy fuel supply for historic and classic vehicles is one of the tasks that QHMC and AHMF have set as a key advocacy priority as Government policies develop progressively.

That said, petrol and diesel are not going away immediately, and it is also likely that exemptions for historic ICE vehicles not being used as daily drivers can be sought at least for some time yet. As supplies are reduced over the next years towards 2050, no doubt costs will increase, and availability reduce.

However, while its impossible to predict the future, as will be presented in the Legacy Fuels section below, there are already a number of universities that have demonstrated carbon neutral synthetic-fuel technologies that use carbon capture from the atmosphere to create 'drop-in' fuels for ICE vehicles of all types.

LEGACY FUEL QUESTIONS

QUESTION: What is a Legacy Fuel?

Legacy fuels are the fossil fuels we rely on today, petrol, diesel, LPG and avgas maintained for specific conditional uses such as historic and classic motor vehicles, in spite of Government commitments to phase out fossil fuel use over time and deliver 'Net Zero' carbon outcomes by 2050.

The maintenance of Legacy Fuels may not be necessary if adequate supplies of carbon-neutral 'drop-in'' fuels become available over time, although the cost of these synthetic fuels is a question it is not possible to determine at this time. The most likely scenario is a parallel phase in and phase out process over the next 30 years.

QUESTION: Will fuels used in current cars (1900-20222) be available at an affordable price in the future?

This is a question that is not possible to answer definitively at this time, although it is highly likely that pricing will be a major mechanism likely to be used by Government in time to discourage the use of fossil fuels as we get closer to the 2050 'Net Zero' target date.

QUESTION: What actions are being taken to ensure a supply of Legacy Fuels into the future for ICE vehicles of all types?

Maintaining legacy fuels for historic and classic vehicles is one of the key roles of the Legacy and Alternative Fuels Committee (L&AFC). L&AFC has been established to be the advocacy arm on this matter for QHMC in relation to actions taken by Government within QLD.

A member of L&AFC (Christine Stevens) represents QHMC on the relevant AHMF committee undertaking the same advocacy role at a National level.

QUESTION: How long will Legacy Fuels last for?

This is also a question that is not possible to answer definitively at this time, although they will no doubt be still available through to at least 2050, their co-existence with new generation carbon-neutral synthetic fuels is highly likely and therefore this is likely to be a moot question.

QUESTION: What Low Carbon fuel options might there be for ICE vehicles moving forward?

There are many instances now from universities around the world where they have developed technology to capture carbon dioxide (CO2) from the surrounding atmosphere and repurpose it into useful synthetic fuels and chemicals usually made from fossil fuels. The technology effectively replaces fossil fuels with carbon dioxide and renewable hydrogen as the building blocks of other important chemicals. Universities that have announced such pilot technologies include Surrey, Cincinnati, Stamford, Oxford, and a joint venture between Melbourne's Monash University and Hokkaido University. The main issue now is how effectively and economically these technologies can capture historical carbon from the atmosphere and ramp up production to a scale necessary to be effective. Give there are so many different pilot projects already underway and the urgency of the problem, one would have to say just on probability alone there is a good chance that one or more will manage to succeed.

QUESTION: Legacy fuels are one thing, what about lubricants?

The same answer applies here as for fuels in general. While fossil fuels are available so will the lubricants also be given they are typically part of the same distillation processes. Many lubricants are already totally or partially synthetic already. It makes sense to think that the same synthetic development of carbon dioxide and hydrogen engineered fuels and chemicals will also enable lubricants.

QUESTION: Will Legacy fuels be widely available to country drivers not just the big cities?

This is another question that is not possible to answer definitively at this time, although it is hard to see how/why they would not be.

QUESTION: Is it the environment lobby responsible for the move away from fossil fuels?

No, the environment lobby is not responsible for the move away from fossil fuels. The existence of climate change has been established by scientific measurement by thousands of independent scientists and scientific organisations and accepted by Governments including Australia at an international level as a result of actions within the International Panel on Climate Change (IPCC) a United Nations organisation. If the environment lobby has any responsibility for climate change being made more visible it is purely as voice to remind Governments, organisations and citizens about the importance of climate change issues when creating policy, making investments and when voting at elections. In the most recent election the importance of climate change in the results of the election showed how citizens' deep concerns about the issue have reached a point where more people are concerned about a lack of action than before.

According to Climate Compass, in last year's election 47% of voters who voted independent and 42% of those who voted Labor did so primarily due to concern over climate change.

More than half (58%) of Australians had become more concerned about climate change over the past two years, and nearly three-quarters (74%) believed governments should be doing more to address it.

QUESTION: If legacy fuel supplies are not maintained:

1. how will we be reimbursed for the loss in value of our cars/collection that we have spent a lifetime gathering and restoring?

From the committee's perspective, none of these changes are likely to see Government policy having a direct impact on the value of historic and classic cars within the next 5-10 years. That said, the changing social conditions i.e, fewer drivers being licensed for manual cars, (less than 5% currently apparently), and greater concerns around climate change may impact the interests in ICE cars generally over time. It is somewhat of an unknown, most likely only time will tell how values perform as to whether younger generations more concerned with climate change and enjoying e-mobility transport like scooters become engaged with historic and classic vehicles.

2. what becomes of the repairers and parts suppliers of existing cars, the loss to the economy will be massive?

This is indeed a bigger question than just about climate change. It is a generational issue. We are already seeing dramatic changes in availability of skills in traditional trades like metal forming, welding, painting, mechanical restorations etc with already existing skills shortages as older tradespeople retire and younger generations are seemingly typically less inclined to engage with these skills and vehicles. Many skills are already being lost and skilled tradespeople are finding it it exceedingly difficult to find apprentices to pass on their knowledge to.

Conversationally, it seems computer-based ICE cars started the movement away from 'repair and restore' approach to vehicle maintenance to a 'diagnose and replace' approach as the norm. There is definitely a training and worker interest/availability issue already. No doubt the increasing switch to EVs and the different skills required will shift the focus further from 'old school' mechanical repair and restoration and tend to make this shortage worse. Will there be enough residual interest within society to keep up the interest in developing training courses and getting new generations interested in older mechanical vehicles? Considerable integrated efforts will likely be required at Local, State and National levels if we are to ensure that this is the case.

QUESTION: Are conversions to hybrid using components from hybrid vehicles (also full electric) likely to fall under some form of legislature in the future?

A code has existed from some time already. As part of the National Code of Practice for Light Vehicle Construction and Modification (VSB 14*),* NCOP14 - Guidelines for Electric Drive (2011) is the National Code which sets out minimum expectations and standards of work to be done in converting a vehicle over to an EV drive. Any conversion will also need to be assessed and certified by an QLD certified Automotive Engineer. QLD TMR handles any administrative requirements including, but not limited to:

- Registration processes;

- Fees for processes such as registration, issue of temporary permits, vehicle inspections; applications for approval to modify, applications for exemptions etc.;
- Determination of the date of manufacture for Individually Constructed Vehicles;
- Processes for submitting applications; and
- Administration and management of modification schemes including the administration of signatories.

QUESTION: Will government impose restrictions on bulk fuel storage at residential addresses?

Safety requirements already exist but no doubt if bulk fuel storage become more prevalent legislative responses would change given how dangerous it is within the close confines of residential allotments.

HYBRID & ELECTRIC VEHICLES & ENERGY SOURCES:

LEGISLATION

QUESTION: When will EV's be exempted from punitive taxation to encourage uptake (transfer taxes, luxury vehicle taxes etc)?

Nationally, in September 2022, the Australian Federal Government has passed its **Treasury Laws Amendment (Electric Car Discount) Bill**, which will provide up to $2000 off the purchase price of battery electric and plug-in hybrid vehicles, as well as fringe benefits tax (FBT) exemptions for fleets and novated leases. The bill also includes the removal of the import tariff for zero and low emission vehicles beneath the luxury car tax (LCT) threshold. Zero-emissions vehicles such as EVs – and so-called fuel-efficient vehicles with a combined fuel consumption rating of 7.0 litres per 100 kilometres or less –received a more differential threshold increase from the ATO of an extra 6.6 per from Financial Year 2022-23 as below:

Financial year	Fuel efficient vehicles	Other vehicles
2022–23	$84,916	$71,849
2021–22	$79,659	$69,152

In QLD, $3,000 rebates are available to eligible Queensland individuals and businesses who have purchased a new Zero Emission Vehicle (ZEV) with a dutiable value of up to $58,000 (including GST) on or after 16 March 2022.

QUESTION: What is the likely role of Hydrogen for ICE vehicles in future?

QUESTION: The potential power/torque output from an electric powerplant will exceed the dynamic capabilities of any of the restorations - late or early vehicles. Are there likely to be rules issued by ADR or the like to allow these conversions to proceed under the umbrella of a common focus?

QUESTION: Is it likely that ICE vehicles will be banned altogether at some stage in the future? Will allowances be made for Historic, Vintage and Classic vehicles?

QUESTION: With mass uptake of EVs, will Australia have enough power to run them especially with coal fired power stations closing down?

QUESTION: Are older cars going to be taxed out of existence?

QUESTION: Is there likely to be any mandatory conversion to hybrid or electric?

QUESTION: Will there be limits put on number of classic cars fully registered in the future?

QUESTION: Is the Government (Federal or State) contemplating subsidising the costs of such work necessary, to keep our classics and others 'on the road'?

HYDROGEN

QUESTION: What role is Hydrogen likely to have in the context of current and future ICE vehicle types?

QUESTION: What strategies/policies are emerging (government and corporate) to provide hydrogen fuelling infrastructure?

QUESTION: If Hydrogen were to be introduced on a broad scale would petrol stations everywhere need to be converted?

QUESTION: What is the safety of Hydrogen Fuel like?

QUESTION: Can ICE motors be converted to hydrogen for classic cars?

QUESTION: Is it true that presently there appears to be two approaches to using hydrogen to power vehicles - 1 that burns Hydrogen in a conventional ICE format & another that uses hydrogen to power and ICE generator to power an electric motor?

QUESTION: Having heard a professor from the ANU explaining that hydrogen is going to be generated using solar and wind-farm electricity, what are we going to use to power our homes when the coal-fired power stations are put offline?

GOVERNMENT SUPPORT

QUESTION: Do Hybrids & EVS received any Government support in the form of rebates?

QUESTION: The commitment for net-zero by 2050 will strive to phase out gasoline and increase "electric" (either battery or hydrogen (ammonia??) to

provide the potential energy), how do we best convince the authorities that a number of remaining operating "classic cars" are of intrinsic historic and heritage value and with offsets can remain in the community?

QUESTION: EV's have far fewer moving parts and much lower servicing requirements (quote "The drive-train in an ICE vehicle contains 2,000+ moving parts typically, whereas the drive-train in an EV contains around 20") , will there be a re-skill transition plan for displaced motor servicing personnel?

EV INDUSTRY & IMPACTS

QUESTION: What are the benefits to owners of EVs?

The major financial benefits directly to owner relate to the savings generated by owning them. In a recent survey of Tesla owners nearly 50% of respondents identified that they save over $2,000 per year in fuel costs.

Other savings come from maintenance with 65% identifying they are not required to follow a maintenance schedule given Tesla vehicles do not require formal logbook servicing. This results in 31% of the nearly 750 survey participants reporting $700-$1000 savings and 34% reporting $1000-$2000 annual savings.

https://electricvehiclecouncil.com.au/wp-content/uploads/2022/09/EVownerinsights.pdf

QUESTION: What is the EV resale market like? Are they easy to sell second hand?

QUESTION: Are EVs limited just a few first world countries and markets in the world?

QUESTION: What is the take up of EVs with the major car manufacturers?

QUESTION: Have any Major Car Manufacturers committed to only producing EVs apart from Tesla?

QUESTION: Are EVs going to cause a global recession when their uptake forces whole industries to close?

QUESTION: Are EVs really suitable for commercial vehicles, trucks, tradies' utes etc?

QUESTION: How environmentally friendly is EV manufacturer and disposal?

QUESTION: How do the energy and carbon impacts required to build batteries compare to conventional internal combustion engines?

QUESTION: How do the climate impacts generated in charging batteries compare to running conventional internal combustion engines?

QUESTION: How significant are the "green" emissions created through the EV manufacturing and disposal process?

PRACTICALITY/LIFESTYLE:

QUESTION: Why do we need EVs? What's the matter with ICE vehicles?

QUESTION: The sound of a combustion engine is a major influence on a drivers choice to buy and maintain one in the first place, how is this compatible with an electric future?

QUESTION: How practical are EVs for commuting?

QUESTION: Do EVs need charging station at both ends of a trip?

QUESTION: Are EVs suitable for long distance travel, or remote and off-road destinations?

QUESTION: Will the cost of EVs reduce from the current high levels?

QUESTION: Are EVs only suitable for some people?

QUESTION: Do they have less luggage room?

QUESTION: Do they mean we need another vehicle in the household?

QUESTION: Is it a different style of driving when compared to ICE vehicle?

QUESTION: Is the acceleration faster than an ICE vehicle?

QUESTION: Are there new safety requirements for EVs?

QUESTION: Are the batteries dangerous if an EV is turned off?

QUESTION: Are there any beautiful EVs?

QUESTION: EVs are designed to track driving habits, locations, charging points, and so on. Are you sure that you want your every move to be recorded on a server?

QUESTION: Are most ordinary EVs slow to drive?

QUESTION: When will EV embedded technology be capable of vehicle access-on-demand sharing and therefore reduce the need for individual ownership of the vehicle?

FEATURES:

QUESTION: Are EVs heavier than usual vehicles?

QUESTION: What sort of features do EVs have that are different to ICE vehicles?

QUESTION: How are EVs better than ICE vehicles?

QUESTION: How are EVs different to drive than ICE cars e.g. compared with Constant Velocity Transmissions vs Torque Convertor Gearboxes?

COST:

QUESTION: Are EVs more expensive to manufacture than ICE vehicles?

QUESTION: Are Electric Vehicles Expensive? Can regular people afford one?

QUESTION: What are the comparative costs of charging an EV at home, or work compared to ICE vehicles?

QUESTION: Are significant EV development and construction costs being borne by Australian Taxpayers?

BATTERY SUPPLY CHAIN & MINERALS

QUESTION: What are the main resources used in batteries and what ethical issues are attached to the main ones? E.g. Cobalt predominantly comes from the Congo Republic much of it with disregard for the health and welfare of the workforce, what sustainable and ethical sources are there?

BATTERY TYPES:

QUESTION: Will we still be able to buy lead acid car batteries as we do now?

QUESTION: What Types of Batteries are there?

QUESTION: What is their Useful Life?

QUESTION: How long will it take to make a battery that is to last the life of the car?

QUESTION: How much do battery's charging capacity degenerate each year?

QUESTION: Do batteries drain faster in city driving or freeway driving?

QUESTION: How does regenerative braking work?

QUESTION: How likely is it that improving battery technology will allow new battery types to be retrofitted into an older battery powered vehicle?

QUESTION: Since 2010, the average price of a lithium-ion (Li-ion) EV battery pack has fallen from $1,200 per kilowatt-hour (kWh) to $132/kWh in 2021, when can we expect to see $50/kWh cost?

QUESTION: Li-ion battery technology is around 0.5 kWh/litre, new storage technologies will improve this, when will we see 1.0 kWh/litre storage?

QUESTION: When will we have change over/exchange battery packs for long distance ?

CHARGING:

QUESTION: How are EVs charged?

QUESTION: How quickly do EVs charge?

QUESTION: How far do EVs travel on a single charge?

Tesla Model 3 comparison: average over all modes except mountains = 145Wh/km

- **Motorway heavy traffic at max 80km/hr 2 people medium load Autopilot engaged= 120wh/km**
- **Motorway light traffic at max 100-110km/hr 2-4 passengers medium load Autopilot engaged= 135wh/km**
- **Motorway light traffic at max 100-110km/hr 2-4 passengers medium load manual acceleration = 145wh/km**
- **City and suburban driving 2-4 passengers medium load manual acceleration = 145wh/km**

- **Mountainous conditions and/or heavy acceleration 2-4 passengers medium-high load manual acceleration 180Wh/km**

Tesla Model 3 With Caravan

Country driving undulating 80km/hr 2 people medium load, manual operation 300Wh/km

Country driving mountainous 80km/hr 2 people medium load manual operation 390Wh/km

QUESTION: What is the electric vehicle distance comparison compared to kms per litre?

QUESTION: Will there be enough charging points to satisfy all EVs?

QUESTION: Will the additional load on the electricity grid created by EVs overload the system?

QUESTION: Wont additional space be required to create enough charging points for EVs?

QUESTION: How can we recharge in small towns?

QUESTION: What are the Plug variations for charging? How universal are they?

QUESTION: What happens if an EV runs out of charge along the way, is there a 'Plan B' option available?

QUESTION: Are there Chargers in regional and remote areas?

QUESTION: Does cold weather affect EV batteries?

QUESTION: What charging infrastructure is going to be available by 2025 and 2030?

QUESTION: Will the charging infrastructure be powered by renewable energy of coal fired power stations?

QUESTION: How do we charge batteries at night with no sun or wind?

MAINTENANCE

QUESTION: Do EVs require specially trained mechanic and equipment to service vehicles?

QUESTION: What is the regular maintenance required?

QUESTION: Can batteries be serviced, or do they have to be replaced only?

QUESTION: Can they be recycled, and can that be done locally?

QUESTION: Do EV tyres wear faster?

QUESTION: How long do brakes last in an EV?

QUESTION: IS getting an EV repaired more expensive or harder?

SAFETY:

QUESTION: As electric cars produce no/limited noise, will this produce a safety concern for pedestrians etc?

QUESTION: Can faulty batteries cause a fire?

Yes, according to a study by AutoInsuranceEZ based on US Government data, batteries are the most common cause of fire in Hybrid and EV vehicles, with electrical faults being the number 1 cause of fires in ICE vehicles.

Number Recalled (2020)	Fuel Type	Number of Models Affected	Make/Model(s)	Cause of Fire
430,000	Gas	1	Hyundai Elantra	Electrical Short
308,000	Gas	2	Kia Cadenza & Sportage	Electrical Short
250,000	Gas	1	Honda Odyssey	Electrical Short
95,000	Gas	2	Hyundai Genesis & Genesis G80	Anti-Lock Braking System
82,000	EV	1	Hyundai Kona	Battery
70,000	EV	1	Chevrolet Bolt EV	Battery
27,600	Hybrid	1	Chrysler Pacifica	Battery
4,500	Hybrid	7	BMW 530e, xDrive30e, Mini Cooper Countryman All4 SE, i8, 330e, 745Le xDrive, & X5 xDrive45e	Battery
2,800	Gas	2	McLaren Senna & 720S	Fuel Leak

Table: AutoInsuranceEZ.com
Source: Recalls.gov

QUESTION: How quickly can it spread to other vehicles? I've seen an EV fire destroy 3 vehicles in 1.15 minutes.

lithium-ion battery fires in electric cars are significantly harder to put out than gas fires, and most firefighters aren't familiar with how to put out EV fires since electric cars are relatively new. Because EV batteries are essentially their own fuel source, they can burn for hours and be extremely difficult for firefighters to cool down.

QUESTION: How do Fire and Emergency Services put out EV fires - do they require special equipment?

While EV battery fires may be extinguished with special equipment, a study quoted by Driven.com.au indicates EV battery fires can also be extinguished conventionally with "up to 150,000 litres of water". By comparison, when a petrol or diesel car catches fire, it can be put out with between 500 and 1000 litres of water.

The following questions and responses are from the Best Practices for Emergency Response to Incidents Involving Electric Vehicles Battery Hazards: A Report on Full-Scale Testing Results study sponsored by the US Government's Department of Transportation:

QUESTION: How long must suppression efforts be conducted to place an EV fire under control and then fully extinguish it?

Total times for extinguishment (elapsed time spent actively suppressing the battery fires) ranged from 6 to 49 minutes; however, this does not include reignition, which occurred in one case, 22 hours later. First responders should be prepared to conduct suppression efforts for one hour or more.

QUESTION: Is current PPE appropriate with regard to potential electric shock hazards?

An analysis of current and voltage measurements recorded at the discharge of the nozzle indicated no significant current or voltage readings in any of the tests. Based on the test data, full NFPA compliant PPE is appropriate…

QUESTION: How effective is water as a suppressant for large battery fires?

All suppression tests were conducted with water without any additional additives. This water was able to suppress the battery fires each time.

QUESTION: Hybrid and EV fires do not require special equipment for fire suppression / extinguishment.

No special equipment for fire suppression / extinguishment was evaluated as a part of this test series. Traditional hose lines and nozzles utilizing water as the suppression agent were utilized to extinguish all EDV battery fires. In all suppression tests, extinguishment was achieved, and the batteries were safely extracted from the vehicles.

QUESTION: Do EVs & PHEVs require a smoke alarm above home charging station?

It would appear from current research that it is not mandatory to have smoke alarms included near an EV charging point, although advice is it is advisable.

QUESTION: What is the percentage of battery fires resulting from charging compared to lead acid charging fires?

According to the NY Times, like all vehicles EVs sometimes catch fire and typically these fires generate headlines, but EV angst appears to be unwarranted. The NY Times quoted a study by AutoInsuranceEZ that looked at the frequency of fires from all causes, in all automobiles during 2021.

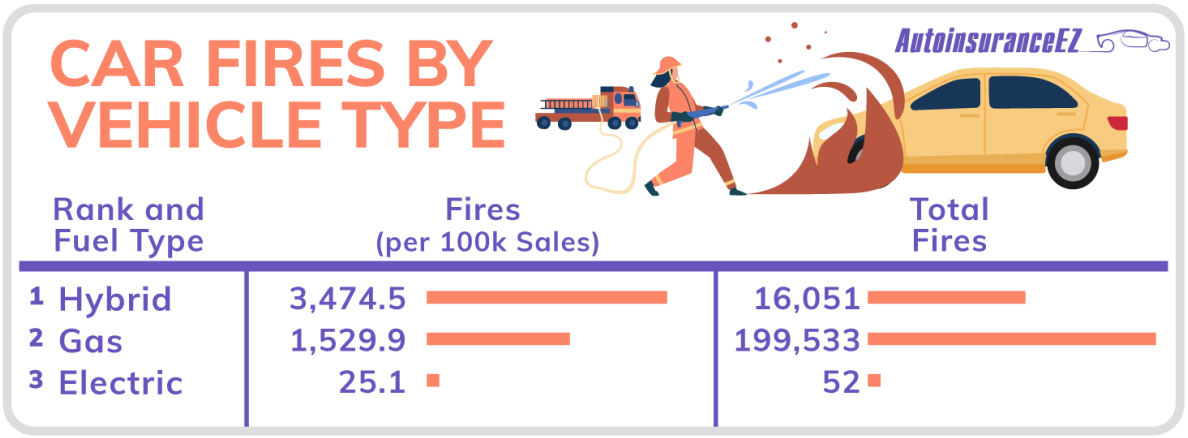
It found that **hybrid vehicles**, which have an internal combustion engine and an electric motor, had the most fires per 100,000 vehicles (3,475), while vehicles with just an **internal combustion engine** placed second (1,530 per 100,000). Full EVs had the fewest fires at only 25 per 100,000. Doing the calculations this means that

Hybrid vehicles have twice the fire incidence of ICE vehicles, and 140 times higher than EVs.

EVs have 60 times lower incidence of fires than ICE vehicles; and

The largest cause of fires in ICE vehicles is electrical faults.

These findings were based on data from the National Transportation Safety Board and the Bureau of Transportation Statistics.



According to the Australian online car magazine Driven.com.au, data confirms this from other sources, e.g. showing that 'Teslas are 11 times less likely to catch fire than any typical ICE car…and…Furthermore, older petrol-powered vehicles – and ones that have not been properly maintained – are more likely to catch fire or have mechanical breakdowns".

"From 2012 to 2020, there has been approximately one Tesla vehicle fire for every 330 million kms travelled. By comparison, data shows that in the US there is one ICE vehicle fire for every 30 million kms travelled," Tesla's *2020 Impact Report* claimed.

What AutoInsuranceEZ researchers found is that despite the focus on EV fires in the news, they are not inherently more dangerous than gas or hybrid vehicles, although electric fires tend to be more difficult than gas fires to extinguish.

END OF LIFE:

QUESTION: Are EV and Hybrid batteries recyclable?

QUESTION: Is EV battery disposal more or less environmentally friendly than lead/acid batteries?

QUESTION: Can EVs be crushed or recycled at the end of life?

QUESTION: Will electric vehicle last for over 125 years? LPG Vehicles only lasted 20 years.

QUESTION: Is the cost of disposal the most expensive aspect of each vehicle – is it paid for by Taxpayers?

QUESTION: Are sufficient recycling facilities available to recycle EVs?

OTHER ISSUES

QUESTION: Organisations like the QHMC must pressure the government to ensure that owners of classic and historic vehicles will still have access to suitable fuel after the changeover to EVs. Otherwise thousands of vehicles will be left stranded in people's garages and sheds.

QUESTION: How can the Governments we elect for the people increase rego. costs every year yet road maintenance in rural areas is virtually non-existent?

QUESTION: Why are cars are so big? They require too much energy to propel.

QUESTION: Should we learn to accept less performance for everyday use?

QUESTION: Share cars and car pools could reduce need for ownership, reduce road traffic and pollution, why aren't these options being promoted?

QUESTION: It is very important to us using vintage & classic vehicles that similar compatible fuel is available for us. As without fuel our vehicles become useless and worthless.

QUESTION: What market will there be for all the ICE powered vehicles in the future?

QUESTION: Suggest you read the book "Green Murder" by Ian Plimer.

QUESTION: Classic cars generate jobs. How can this be recognised as one of the societal benefits of maintaining our classic and historic vehicles?

QUESTION: What is happening with the parallel development of electric tractors, long haul trucks, electrification of all inland railway systems, electric aeroplanes, maritime, etc.?

QUESTION: None…we have a Tesla and it's fantastic as a daily in enabling us to afford the running costs of our classics by having no fuel or servicing costs.