# EVC submission to ACCC Lithium Ion Battery Safety consultation.

## February 2023

**With relation to:**
**https://consultation.accc.gov.au/accc/lithium-ion-batteries-issues-paper/supporting_documents/ACCC%20Lithiumion%20Batteries%20Issues%20Paper.pdf**


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## Preamble:

The Electric Vehicle Council (EVC) is the national peak body representing the electric vehicle industry in Australia. As the market is emerging in Australia, our work is particularly aimed at increasing certainty for investment through policy, knowledge sharing and education.

The Australian Competition and Consumer Commission (ACCC) is an independent Commonwealth statutory authority whose role is to enforce the Competition and Consumer Act 2010 and a range of additional legislation, promoting competition, fair trading and regulating national infrastructure for the benefit of all Australians.

This consultation relates to an issues paper released by the ACCC in December 2022, which is intended to obtain information relating to safety issues associated with Lithium-Ion batteries, with a view to informing development of recommendations to mitigate safety risks associated with Li-Ion batteries.

It is the view of the EVC that this consultation and the resulting work will be a key element informing the future regulatory environment around road registered Electric Vehicles, and their associated charging infrastructure.

The EVC welcomes ongoing involvement in discussions and work on this topic, and can be reached via office@evc.org.au

## Exec summary:

The EVC believes that a clear distinction must be drawn between road-registered vehicles as a class of Li-Ion battery containing consumer products, and all other Li-Ion battery containing consumer products. This is because the existing regulatory environments applicable to these two product classes are entirely different, driving an entirely different consumer safety outcome. Additional segmentation may be required in other product classes, but it is primarily segmentation between road registered vehicles, and everything else, that we are concerned with in this instance.

We are at the start of the transition in our road-registered vehicle fleet from internal combustion engines to battery electric propulsion. This is a transition that will:

- Be a key enabler to Australia achieving our net zero targets.
- Significantly improve the air in our cities.
- Reduce our reliance on foreign oil imports (delivering national security and balance of trade improvements
- Create massive additional demand for Australian mineral exports.
- Deliver direct cost of living benefits to all Australians.

It is also a transition that is inevitable at this point. Based on actions from overseas governments, global automotive OEMs are already announcing end dates for the production of petrol cars.

Various parties in Australia are seeking to institute regulatory conditions that will inhibit and drive up the cost of the transition to electrified road transport, citing fire safety as the reason. These parties do not typically present evidence or cost-benefit analyses for their positions.
Our key position in response to this consultation is that changes in regulatory measures associated with road registered electric vehicles and their charging infrastructure should be evidence based, particularly where those interventions would have the effect of driving up costs imposed on consumers.

The local evidence to this point (> 80,000 road registered EVs on Australian roads, zero recorded instances of consumer injury associated with those vehicles containing Li-Ion batteries vs not containing Li-Ion batteries) does not favour costly regulatory intervention, nor does the data from the wider global context.

Our existing regulatory regimes across road registered vehicle and electrical installation domains, while fragmented across the states and in need of harmonisation, is strong from the point of view of consumer safety and is already delivering sound consumer outcomes.
In the timeframe provided, we have limited our detailed response to a few key questions and added an appendix of additional considerations. The EVC would be happy to engage in ongoing discussions on this matter with the ACCC and/or other interested parties.

## Responses to specific questions:

### 2: Do you consider the characterisation of the hazards of Li-ion batteries in Table 1.3 accurate and why? Are there other hazards?

The lithium metal when deposited on the surface of anode may form dendrites and pierce the separator between cathode and anode leading to short circuiting. (This information may also be added to better characterise ***overcharge*** fault).

Moreover, ***over discharging*** is also one of the electrical faults which can lead to undesirable consequences for Lithium-Ion batteries. Please include it as well.

a. Ma T, Wu S, Wang F, Lacap J, Lin C, Liu S, Wei M, Hao W, Wang Y, Park JW. Degradation mechanism study and safety hazard analysis of overdischarge on commercialized lithium-ion batteries. ACS Applied Materials & Interfaces. 2020 Dec 1;12(50):56086-94.

When used in packs and modules, ***inconsistency*** between Lithium-Ion cells is important to look for. The inconsistencies between cells lead to overcharging and/or over discharging of some cells in the pack leading to thermal runaway. Inconsistency induced during initial manufacturing and integration can cause differences of 25% in impedances and 9% in capacities between cells.

a. Gogoana R, Pinson MB, Bazant MZ, Sarma SE. Internal resistance matching for parallel-connected lithium-ion cells and impacts on battery pack cycle life. J Power Sources. 2014 Apr 15;252:8–13.
b. Kenney B, Darcovich K, MacNeil DD, Davidson IJ. Modelling the impact of variations in electrode manufacturing on lithium-ion battery modules. J Power Sources. 2012 Sep 1;213:391–401.
c. Pastor-Fernández C, Bruen T, Widanage WD, Gama-Valdez MA, Marco J. A Study of Cell-to-Cell Interactions and Degradation in Parallel Strings: Implications for the Battery Management System. J Power Sources. 2016 Oct 15;329:574–85.

***Short circuiting*** is an important safety hazard for Lithium-Ion batteries. Our suggestion is to include this in table 1.3 as well. Short circuits can be categorised into two different types: 1) Internal Short Circuit (ISC), and 2) External Short Circuit (ESC). ISCs are found to be responsible for 40% of fires whereas ESCs are responsible for 20% of the fires and together short circuits within batteries of Li-ion battery packs contribute to the majority of fires. There are three types of battery short circuits from the perspective of a trigger mechanism; a battery short circuit caused by overcharge/discharge, a battery short circuit caused by mechanical damage, and a self-induced battery short circuit.

a. Xiong R, Sun W, Yu Q, Sun F. Research progress, challenges and prospects of fault diagnosis on battery system of electric vehicles. Appl Energy. 2020 Dec 1;279:115855.
b. Jiang L, Diao X, Zhang Y, Zhang J, Li T. Review of the Charging Safety and Charging Safety Protection of Electric Vehicles. World Electr Veh J. 2021 Dec;12[4]:184.

## 8. Are there particular Li-ion battery products, brands or manufacturers you have safety concerns about? Please provide an explanation and/or evidence to support your response.

The EVC has a strong interest in lithium-ion batteries in the context of road-registered vehicles. The EVC believes that risks associated with lithium-ion batteries in other product types are, in some cases, being conflated with risks associated with batteries in road registered electric vehicles, in a manner likely to inhibit the ability of consumers to transition to electric vehicles, and drive up the overall cost of housing, without any adequate evidence being presented.

By way of example, in the lead up to this ACCC consultation closing, the ABC has reported data relating to injuries and housefires resulting from dangerously low quality electric micro-mobility products such as bikes and scooters:
https://www.abc.net.au/news/2023-01-18/e-scooter-lithium-battery-fire-risk-fears-/101863902
https://www.abc.net.au/news/2023-02-02/lithium-ion-batteries-pose-new-fire-risk-says-firefighters-union/101888598

The EVC observes that while electrified micro-mobility presents an excellent pathway to reducing overall transport emissions and lowering the overall cost of transport, and that the technical standards associated with these types of products may be adequate, the regulatory environment around these products in Australia is presently inadequate. The importation and sale of equipment of this type is very lightly regulated in practice, which will predictably result in the importation and sale of cheap, non-compliant product. Better regulation, and regulatory enforcement activity, around the importation and sale of this type of product is needed.

By comparison, road-registered vehicles, such as cars, motorbikes, and trucks, are massively regulated, with strong enforcement regimes. The absence of reports associated with road-registered electric vehicles in tables 1.4 and 1.5 is one of the outcomes of this difference in regulatory environment. Global Automotive OEMs are certainly aware of all the hazards detailed in table 1.3 in the issues paper, and already design their products to minimise the associated risks, in the context of a consumer product type where high speed mechanical damage needs to ***not*** result in a fire.
For example: https://www.dekra.com/en/high-safety-level-of-series-produced-electric-cars-confirmed-in-dekra-crash-tests/

Further, where a global vehicle manufacturer identifies a problem that has the potential to result in a fire, the standard real-world response is a massive recall and rectification process. By way of example, Hyundai identified an issue in their Kona product, which had the potential to start a fire. Globally, 77,000 vehicles were recalled and rectified, including about 800 in Australia. No actual fire incidents occurred in Australia as a result of this issue – the potential hazard, having been identified by Hyundai, was corrected by Hyundai before the fault resulted in a fire in this country.

The result of this much more stringent regulatory environment is that while the battery in a road-registered electric vehicle like a car is much bigger than the battery in something like an electric scooter, it is far less likely to catch fire. The data bears this out – EV fire safe, one of the leading research organisations in this space, has sought to identify the number of EV battery fires globally, and has discovered 246 instances since 2010, across a global battery electric vehicle fleet of more than 20 million units. Fires in electric cars are rare, and less common than fires in petrol or diesel cars.
https://www.evfiresafe.com/_files/ugd/8b9ad1_6fa2d5ae7ffd46e69b91d84d4de2f6c8.pdf

In the Australian context, as at the end of 2022, we're up to approximately 83,000 road registered plug-in Electric Vehicles (PHEVs and BEVs, not including mild hybrid vehicles like the Prius, which have been in the Australian market since the late 1990s). To this point, the EVC is aware of 3 instances of the main traction battery in an Electric Vehicle (BEV or PHEV) catching fire in Australia, outside of the deliberate activities of firefighting agencies undertaking live training or research:

- In 2020, a fire started in a garage independently of the car, which then consumed the car.
- In 2021, a fire consumed an electric car, with the cause suspected to be arson.
- In 2023, a fire consumed two electric cars in a garage. This one happened very recently, so is still under investigation, but appears to be intentional.

The EVC does not generally collate figures of this type, so it's possible that there are instances of which we're not aware, but it should be apparent from this list and the absence of reports in table 1.4 in the issues paper that road-registered EV fires are rare, and that in comparable circumstances (the garage catching fire independently of the car, or arson), petrol or diesel cars would be just as likely to burn.

Car fires are of course non-trivial when they happen. They do happen from time to time, and they will continue to happen. Regardless of the motive fuel source (petrol, diesel, LPG, electricity, hydrogen) a car fire creates toxic smoke, has significant potential to result in the ignition of other nearby parked cars, and other nearby flammable materials such as might be found in a suburban garage, attached to a house. For this reason, the National Construction Code and state level building regulations have, for a long time, mandated a wide variety of fire safety measures in buildings, including the use of sprinkler systems in large underground car parking areas, and smoke detectors in homes.

A fire involving a battery electric vehicle can be expected to exhibit different characteristics to a fire involving a petrol or diesel vehicle, because of the presence of the battery, and the absence of a tank full of liquid hydrocarbons. It is to be expected that first responders such as fire fighters will need to develop appropriate techniques and be provided with appropriate equipment for fighting these fires as and when they occur. Governments should support the relevant research activities associated with this. In the context of the fire within the structure, however, global experience has shown that when fires involving large numbers of cars happen in structures, the battery electric cars don't behave much differently to the petrol electric cars – they all burn, the citizenry are kept safe by evacuating them from the area, and the first responders are kept safe by being adequately trained and equipped:
https://risefr.com/media/publikasjoner/upload/2020/rise-report-2020-91-evaluation-of-fire-in-stavanger-airport-cark-park-7-january-2
https://www.youtube.com/watch?v=-6juEM8UTsc

In the development of the latest National Construction Code (NCC2022), the Australian Building Codes Board commissioned expert technical guidance to assess the fires safety implications associated with electric vehicles being parked, and charged, in buildings. This report is provided as an adjunct to this submission. In part, it concludes:
"NCC Performance Requirements address the fire risks of EV charging in carparks adequately."

Despite this, various fire services have taken positions indicating that the potential presence of EVs in buildings, or the installation of EV charging equipment, should mean that the area is treated as a 'special hazard'. No evidence is typically provided to justify these positions, and no detail is typically provided for fire engineers to uses as a basis for determining what a suitably safe design would be. While the guidance documents and position statements from the fire services don't generally have the legal force of regulation (and are therefore not subject to any meaningful form of regulatory impact testing or oversight), they often have the ***effective*** force of regulation – because the community of certifying engineers in this space finds it very difficult to ignore the fire services guidelines. Examples include:
https://www.qfes.qld.gov.au/sites/default/files/2022-04/Electric-vehicle-charging-stations_0.pdf
https://www.mfs.sa.gov.au/community/building-and-commercial-fire-safety/guidelines-and-information/Fire-Safety-Position-Statement-EV-Charging-Stations-in-Buildings-1.0.pdf

The EVC has also received copies of correspondence between fire services (FRV and FRNSW) and fire engineer consultancies during 2021, requesting the treatment of EV charging installations as special hazards, in the absence of those fire services having public position statements. This essentially means that the quasi-regulation in this space has happened without transparency, as well as without evidence base or regulatory impact testing.

The industry peak body for fire services has gone in this direction as well, with the recent publication of a position statement of their own:
https://esa.act.gov.au/sites/default/files/2023-01/afac_evs-in-built-environment_2022-12-22_v1-0.pdf

As with the positions taken by the fire services, evidence is not presented to justify the treatment of EV charging installations as special hazards, nor is it apparent that any form of regulatory impact testing has been done.

The reason that this is important is that a 'special hazard' designation typically carries with it substantial requirements for additional equipment in buildings. The EVC has been made aware of specific instances where the difference between compliance with existing performance requirements for fire safety in car parks, and compliance with the proposed 'special hazard' requirements, amounts to up to $1.5 million (comprised of augmented sprinkler systems, enhanced ventilation, and increased fireproofing in the car parking area) in a medium sized apartment block. This is enough to drive up the cost of housing by 5 to 10%, and more than enough to convince developers to avoid including EV chargers in new buildings. Per above, there is no evidence base to justify the additional cost, and it is not apparent that actual real world safety improvements will result from this approach – but it will definitely:

- Make it harder for people to afford homes
- Drive up the cost of rent for tenants
- Make it harder for people that want to buy EVs to charge them at home, which will slow down our already globally lagging transition to electric vehicles.

Off the back of the fire services and their peak body taking viewpoints along these lines, we are seeing other organisations and industry bodies take positions that are antagonistic to the deployment of EV charging equipment, and the transition to EVs.
For example, the Australian Institute of Building Surveyors has a developed a policy position that approval or authorisation of dedicated electric vehicle charging points in existing buildings should be inclusive of an assessment against technical criteria by a building surveyor.
https://aibs.com.au/Public/News/2022/Member-Alert-Charging%20Electric%20Vehicles%20in%20Buildings%20-%20Draft%20Policy.aspx

This is not currently required in existing buildings, because the installation of Electric Vehicle charging points is electrical work, which is already a highly regulated activity, undertaken by licenced professionals under a robust regulatory regime. Were this position to change in the manner favoured by the AIBS, it would generate significant new income for AIBS members, and raise the cost and complexity of EV charging equipment installations for consumers.
As with the fire services positions, no evidence is presented to justify the additional costs which would be imposed upon consumers, or analysis undertaken to show that the proposed measures will deliver a practical safety benefit.

The EVC calls for federal and state governments to ensure that regulatory requirements associated with the installation of EV charging stations, and the parking of electric vehicles in buildings, are:

- Clear and specific
- Evidence based
- Subject to regulatory impact testing or transparent cost-benefit analysis.

The status quo today is that the installation of EV charging stations is electrical work, subject to the service and installation rules in each state and territory, which call up the wiring rules (AS/NZS3000:2018) and are managed under state and territory level electrical legislation and regulation.

### 14. Do you consider government intervention is required to manage Li-ion battery safety risks? If yes, what form of intervention do you recommend? Please explain your response.

Government intervention is necessary to manage risks associated with all manner of products, inclusive of those including Li-ion batteries. With regard to enhancing regulation in micro-mobility, this will be a shared responsibility between federal and state jurisdictions. A starting point is the regulatory compliance mark (RCM) scheme, co-managed by EESS (relevant to some states) and ACMA (federal, applicable to all states and territories), and referenced by other state regulatory bodies, such as NSW fair trading. This scheme is intended to ensure safety of electrical products. Consideration should be given to the state level bodies that might have a part to play, and the degree to which they are resourced to undertake pro-active enforcement in this area. For example, in Victoria this could include Consumer Affairs Victoria, or Energy Safe Victoria.

Regarding road registered electric vehicles, the regulatory environment is already highly developed and robust, as outlined above. We are one of the safest countries in world with respect to road registered vehicles and our consumer facing electrical installations. The risk to consumers at this point in the transition to electrified road transport is not insufficient regulation or intervention resulting in harm – at this point, the risk is over-regulation and over-intervention, resulting in costs being driven up to the point that consumers are economically locked out of accessing the technology, with the result that Australian EV uptake, already lagging by global standards, lags further.

Where costly new interventions and regulations are being proposed or suggested, such as:

- the treatment of EV parking areas and charging equipment as 'special hazards', or
- the installation of an EV charger in an existing building being an activity that requires engagement of a building survey,

the proponents should be expected to show robust data to justify the intervention, including regulatory impact testing or transparent cost benefit analysis.

For the avoidance of doubt, Fire services and others are seeking an outcome where additional requirements are imposed, at substantial cost to consumers, without evidence as to the need for these measures, or any form of regulatory impact testing. These positions are being pursued despite the presence of robust global evidence that road-registered EVs do not present a significantly higher risk in our built environment than our existing petrol and diesel fleet of road-registered vehicles.

Governments should act on this matter by way of the ABCB and the relevant state level building regulators, to make it clear that the treatment of EV charging installations and EV car parking locations as 'special hazards' is not required at this time.

To the extent that any doubt remains, governments should support research activity aimed at closing knowledge gaps, which might enable future evidence based changes to building requirements with respect to the intersection of fire safety and road registered electric vehicles. For example, it may be appropriate to require smoke detectors in domestic garages where they are attached to class 1 dwellings, as a risk mitigation measure addressing the increased presence of Li-ion battery containing products across many classes (micro-mobility, power tools, cars), at relatively low cost.

Further, the EVC calls for governments to undertake work to improve the regulatory environment associated with electrified micro-mobility, in the interests of consumer safety, given that consumer harms are demonstrably occurring in that sector, which is adjacent to ours.

## Additional Items

1. Page 7, second paragraph, last line: electrons are released from the anode and travel back to the cathode via the electrolyte solution. (Correction: electrons always flow back via external circuit i.e., wire. In electrolyte solution ions move across the separator in both directions depending on if the battery is charging or discharging. In the external wire connected to anode and cathode forming a close circuit, electrons flow.)
2. Lithium titanate (LTO) uses lithium titanate as its anode. Section 1.2 on page 7 states "Table 1.1 outlines the ACCC's understanding of the main types of Li-ion batteries based on their cathode chemistry" – Please note, LTO (Lithium Titanate) is used as an anode, not cathode.
3. Lithium Polymer batteries (as to the best of my knowledge) are not used in electric vehicles. Please provide any evidence if it is the case.
4. NMC (Nickel Manganese Cobalt) and NCA (Nickel Cobalt Aluminium) are the most widely used cobalt and nickel-based Lithium-Ion batteries. Please change the name of 4$^{th}$ and 5$^{th}$ entry to NMC and NCA respectively. For the reason, the nomenclature for these entries be consistent with what is reported widely in research literature, web documents, and media outlets.


   a. https://zecar.com/resources/what-are-lfp-nmc-nca-batteries-in-electric-cars
   b. https://www.science.org.au/curious/technology-future/lithium-ion-batteries
   c. https://www.onecharge.biz/lithium-cell-chemistry/#:~:text=Of%20all%20the%20various%20types,cobalt%20aluminum%20oxide%20(NCA).
   d. Chen X, Shen W, Vo TT, Cao Z, Kapoor A. An overview of lithium-ion batteries for electric vehicles. In2012 10th International Power & Energy Conference (IPEC) 2012 Dec 12 (pp. 230-235). IEEE.
   e. Blomgren GE. The development and future of lithium ion batteries. Journal of The Electrochemical Society. 2016 Dec 1;164(1):A5019.