



Electrical safety requirements for e-transport devices

Energy Safe Victoria

Submission by Australasian Fire and Emergency Service Authorities Council (AFAC)

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1 Introduction

The Australasian Fire and Emergency Service Authorities Council (AFAC) welcomes the opportunity to make a submission to the Energy Safe Victoria Consultation on Electrical Safety Requirements for E-Transport Devices. The submission is based on consultation among AFAC membership as well as our broader understanding of the context of the consultation.

We ask the inquiry to note that the submission should not be taken as the position of any single AFAC member. Also, some of our members may have contributed through jurisdictional submissions, and nothing in this submission should be taken as implying that our members do not fully support their jurisdictional submissions where made.

As part of this submission, numerous documents produced by AFAC have been cited. These documents form the foundation of information used for this submission and are referenced in the text with hyperlinks where possible. AFAC takes a leading stance in the publication of industry doctrine which has been drawn on where relevant. Doctrine ranges from high-level, principles-based capstone material, through to technical guidance. Individual agencies make practical and realistic operational decisions on how they interpret this doctrine.

Further information about AFAC's members and our role within the Australian and New Zealand fire and emergency services sector is included in Attachment 1.

2 Executive Summary

The Australasian Fire and Emergency Service Authorities Council (AFAC) is the National Council for fire, land management and emergency service authorities in Australia and New Zealand. Representing 35 members and 21 affiliate members, AFAC supports approximately 288,000 firefighters and emergency workers.

This submission addresses the safety concerns and regulatory challenges associated with the increasing use of lithium-ion battery (LiB) powered eRideable devices. Key points include:

- The growing number of fire incidents involving LiBs, particularly in residential and public transport settings.
- The need for improved regulation, public education, and safe disposal practices for LiBs.
- Recommendations for safe storage and charging of eRideables, and the importance of planning controls for bulk storage.

- The necessity for further research and collaboration to address knowledge gaps and improve emergency response.

3 AFAC Submission

The rapid increase in the number and accessibility of eRideable options available to the public is of particular interest to the emergency management sector. The primary interest is in ensuring the safety of the public and mitigating any possible safety risks posed by mobility devices that utilise emerging and renewable energy technologies.

At AFAC, there are several collaboration groups that are made up of subject matter experts from our member organisations that have an interest in the uptake of devices that utilise emerging alternative and renewable energy technologies such as Lithium-ion Batteries (LiB). These collaboration groups include the Urban Operations Group, State Emergency Service Operations Group, Rescue Technical Group, Alternative and Renewable Energy Technologies Technical Group, Community Safety Group, Built Environment and Planning Technical Group, Climate Change Group and the Fleet Technical Group.

AFAC is involved in guiding research and has developed evidence-based considerations that are apolitical and are focussed on the safe implementation and uptake of alternative and renewable energy technologies. One of the key publications AFAC has developed is a set of [community safety messages for lithium-ion batteries](#).

Energy storage in the form of LiBs has become increasingly common and accepted in a wide range of applications across the consumer, residential, commercial, industrial, and transport sectors. The same technologies used in portable devices such as e-cigarettes and vapes, mobile phones, laptops, and power tools, are now being used in increasingly larger applications as they have become cheaper to produce and more efficient. Electric scooters, electric bikes, electric and hybrid vehicles (EVs), residential solar battery energy storage systems (BESS), data centres, and grid scale BESS commonly utilise LiB technology.

The Battery Stewardship Council estimates that whilst demand for other battery chemistries will remain steady or decline, LiB sales are expected to increase six-fold to over 600,000 tonnes per year

by 2050¹. These estimates are largely based on the projected rise in demand for EVs and battery energy storage in this period.

When LiBs (in any application) fail, they present a number of challenges for emergency responders. Thermal runaway is an exothermic² chemical reaction involving intense, uncontrollable heating, often followed by the violent release of highly toxic, corrosive, flammable, and potentially explosive vapours, and intense, directional, jet-like flames. Thermal runaway can occur due to electrical faults or abuse (such as overcharging or overdischarging, incompatible charging, malfunction of the Battery Management System, short circuits, water ingress), mechanical abuse (e.g. impact, crushing or penetration during crashes), thermal abuse (e.g. exposure to heat from external fire), or cell-level defects (e.g. cell impurities or dendritic growth).

In incidents involving large batteries or large quantities of batteries, emergency responders may encounter problems such as:

- Stranded electrical energy within large battery packs and installations that present significant fire and electric shock risks.
- Complex, resource intensive and protracted extinguishment and cooling
- Toxic fire emissions and effluents, including the containment of large amounts of contaminated fire water that may pollute soil, groundwater and nearby waterways, which present a possible health risk to firefighters, the local community near a fire and to the environment; and
- Secondary ignitions, that may occur without warning some time after the initial event, potentially during recovery, transport, storage, and disposal.

Globally, there is a growing awareness of the hazards posed by LiBs and increasing incidence of LiB fires, with several emergency services agencies reporting elevated numbers of eRideable equipment fires in particular. In 2022, New York Fire Department (FDNY)³ responded to 216 fires that resulted in 6 fatalities and 147 injuries, and the London Fire Brigade (LFB)⁴ reported 116 fires. The Netherlands Institute for Public Safety (NIPV)⁵ reported 327 incidents between 2020 and 2022. Most notably, The

¹ Battery Stewardship Council 2020: <https://bsc.org.au/wp-content/uploads/2020/06/R02-05-A21602-Australian-battery-market-analysis-Project-report-Published.pdf>

² (of a reaction or process) accompanied by the release of heat.

³ NY Times 2023: <https://www.nytimes.com/2023/03/06/realestate/e-bikes-fires-danger.html>

⁴ LFB 2023: <https://www.london-fire.gov.uk/safety/the-home/e-scooters-and-e-bikes/>

⁵ NIPV 2023: <https://nipv.nl/wp-content/uploads/2023/03/20230315-NIPV-Analyse-mediaberichten-branden-met-LEVs.pdf>

National Fire and Rescue Administration (NFRA)⁹ in China reported over 3,000 e-bike fires in the first quarter of 2022 alone.

In NSW, FRNSW are attending an average of over 5 fires per week involving LiBs. Fires involving LiBs have been found to be four times more likely to result in injury than other fires⁶. In the first half of 2024, FRNSW attended 42⁷ eRideable fires. This included an incident in Teralba, NSW that resulted in two fatalities⁸. These were the first LiB related fatalities in NSW and the third and fourth known fire deaths involving LiB devices in Australia, following the March 2022 caravan fire from an e-scooter in south-east Queensland⁹ and the January 2024 mobility scooter incident in Adelaide¹⁰.

In Western Australia (WA), the Department of Fire and Emergency Services (DFES) continues to see an increasing trend in the number of fires involving Libs. DFES responded to 49 fires sparked by Libs in 2020, this figure increased to 166 incidents in 2024, an average of three per week and since 1 January 2025 WA has recorded 87 fires caused by Libs.

In a breakdown of battery incidents attended by FRNSW between 2022 and 2023¹¹, it was found that 44% of the 90 eRideable-related fires were related to charging, while 17% were not charging at the time. In 39% the charging status was not reported. 58% of incidents involved e-bikes, and 27% involved e-scooters. In 6 of the e-bike incidents, there was evidence of tampering, or modification of the e-bike batteries. 72% of eRideable incidents occurred in a residential or accommodation setting, 8% occurred in a commercial setting, and 12% occurred on a public roadway or open space. In 2 of the e-scooter incidents, there were multiple devices in storage within a residential setting, indicative of commercial activities. In jurisdictions where e-scooter use is legal on public roads, e-scooter fires may be higher. For example, in Queensland, where e-scooters are generally permissible in all areas, anecdotal observations indicate that e-scooter fires significantly outnumber e-bike fires.

Post incident management and handling of damaged or defective LiBs can expose workers from all industries involved in investigations, recovery, recycling, and waste disposal, etc., to associated risks and hazards. Following any incident where a LiB has sustained damage or is indicating a fault, there

⁶ FRNSW 2024:

<https://www.fire.nsw.gov.au/gallery/resources/SARET/FRNSW%20LiB%20fire%20data%202022-23.pdf>

⁷ Disclaimer: Audited Data 4 July 2024 - Due to outstanding eAIRS reports this number can change

⁸ FRNSW 2024: <https://www.fire.nsw.gov.au/incident.php?record=recolEO1Vo689xrem>

⁹ QLD Coroner's Court 2024: https://www.coronerscourt.qld.gov.au/_data/assets/pdf_file/0006/804948/nif-tyson-08042024.pdf

¹⁰ The Guardian 2024: <https://www.theguardian.com/australia-news/2024/jan/16/adelaide-mobility-scooter-fire-man-death-crestview-retirement-village>

¹¹ FRNSW 2024:

<https://www.fire.nsw.gov.au/gallery/resources/SARET/FRNSW%20LiB%20fire%20data%202022-23.pdf>

is a risk of a secondary ignition event hours, days or even weeks following the initial incident. There is not yet a clear and viable process for the management, inspection, or disposal/recycling of damaged LiBs of any size.

eRideable devices offer a convenient, cost-effective and environmentally friendly transport option for recreational/professional riders and commuters, and greater independence and flexibility for the mobility impaired. They also contribute to lowering congestion on roads and on public transport. The growing popularity of these devices has seen a rise in fire incidents due to limited awareness of the risks and varying product quality.

There are discussions occurring with Governments around improving regulation of eRideable products sold which include ensuring they meet prescribed standards and certification. There are also collaboration efforts to develop public education campaigns to raise awareness of battery fires and safe practices. While this work is underway, there are a number of issues that fire and emergency services are continuing to grapple with and issues that have yet to be addressed:

1. The storage and charging of devices

AFAC recommends that eRideable devices are stored and charged in well-ventilated, non-habitable areas away and away from egress paths. Many public transport vehicles and buildings lack a safe and secure area for this purpose, requiring users to bring their devices onboard, where devastating fires have occurred. For mobility impaired occupants, it may be necessary for devices to remain near the user, presenting them with limited options.

2. Bulk storage of lithium-ion batteries and devices and lack of planning controls

The Work Health and Safety Regulation 2011 (WHS Regulation) provides for the notification of Schedule 11 hazardous chemicals that are used, handled or stored above certain quantities. Currently, LiBs and eRideable devices are classed as Class 9 dangerous goods articles and are not listed in Schedule 11. This means that there are no legislative controls for bulk storage of these articles. There have been a number of fire incidents around Australia involving eRideable devices in storage or at maintenance facilities, including some connected to share schemes^{12,13,14}. Planning controls around the location, notification to

¹² <https://www.canberratimes.com.au/story/7275719/fire-crews-remain-at-fyshwick-scene-overnight-over-safety-concerns/>

¹³ <https://the-riotact.com/second-fire-in-two-months-at-fyshwick-e-scooter-storage-facility/477462>

¹⁴ <https://www.facebook.com/7NEWSAdelaide/videos/adelaide-e-scooter-warehouse-fire/425514973744263/>

fire services, emergency planning and fire safety requirements for these sites are needed to mitigate the risks to the community.

3. The carriage of eRideable devices on public transport

Following an e-scooter incident on a train carriage at Parsons Green in November 2021¹⁵, Transport for London (TfL) banned e-scooters from London's transport network. Footage from the incident^{16,17} demonstrates the rapid escalation of the battery failure and the hazards that occupants were exposed to within the confined space.

An e-bike fire occurred on a Metro Trains Melbourne service at Union Station on the afternoon of Saturday, March 15, 2025. The incident involved an e-bike catching fire onboard a suburban train as it arrived at the station. The fire filled the carriage with vapour and smoke, prompting passengers to evacuate. Fire Rescue Victoria responded promptly, and the fire was extinguished without any reported injuries.

4. The selling of aftermarket and second-life batteries, and faulty devices online

FRNSW has attended incidents involving e-bikes in which there was evidence of the use of (larger capacity) replacement batteries and DIY repairs. Second-life batteries sold online have an unknown history and can be at higher risk of failure. New York City Council now prohibits the assembly and sale of LiBs assembled or reconditioned using cells removed from used batteries¹⁸.

The fatal incident in February 2024⁷ may have resulted from an accidental puncture of the battery. In February 2023, an e-scooter fire revealed that 40 'water-damaged' devices had been sold at an online auction¹⁹. FRNSW worked with NSW Fair Trading to enact a recall of the products to prevent further incidents.

5. The disposal of eRideable devices and batteries in conventional waste streams

¹⁵ <https://www.standard.co.uk/news/london/e-scooters-banned-tube-underground-parsons-green-fire-b969837.html>

¹⁶ https://foi.tfl.gov.uk/FOI-2474-2122/eScooter%20redacted%2016%2012%202021_.mp4

¹⁷ <https://tfl.gov.uk/corporate/transparency/freedom-of-information/foi-request-detail?referenceId=FOI-2474-2122>

¹⁸ NYCC 2022: <https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=5865911&GUID=A8974463-3FC2-4E68-92F4-07654DBCC658&Options=&Search=>

¹⁹ FRNSW 2023: <https://www.fire.nsw.gov.au/incident.php?record=rec63N0aRvBcLW2f9>

The safe disposal of LiBs is critical to help prevent fires and environmental harm. Due to mixed loads, compaction and fire damage it is often difficult to determine the exact cause of fires in waste receptacles and sites. The waste and recycling industry estimates that lithium-ion batteries were the cause of up to 12,000 fires a year²⁰. In 2022-23, FRNSW attributed 10% of waste fires attended to the incorrect disposal of lithium-ion batteries¹¹. Currently, eRideable batteries are excluded from accredited battery stewardship schemes such as B-Cycle, which means that many end-up in household waste. A fire in a waste truck in Silverwater, NSW in March 2024²¹ involved over 150 incorrectly discarded e-bike batteries.

A structure fire on 26 December 2022 destroyed the Canberra Hume Materials Recovery Facility (MRF), located on the lands of the Ngunnawal people. The MRF provided waste management recycling services for the ACT and six surrounding regional NSW councils. The fire investigation report identified incorrectly disposed lithium batteries as the cause. Since the fire, the ACT Government has been transporting the ACT's recycling material to three materials recovery facilities in Western Sydney and one in Victoria for processing. On average nine truck movements a day transport 229 tonnes of loose, unbaled material.²²

Knowledge gaps and the need for research

AFAC currently facilitates the Alternative and Renewable Energy Technologies (ARET) technical group. This group has been largely responsible for the publication of interim operational advice for dealing with LiB failure to maximise work health and safety for operational emergency service personnel.

The technical group is also involved in:

- Collaboration and information sharing between agencies to identify innovation, progress and best practice
- Advocating for and contributing to improved regulation, codes, and standards to support a safer clean energy transition.

²⁰ ABC 2024: <https://www.abc.net.au/news/2024-06-20/lithium-ion-batteries-10000-fires-australia-waste-management/104002912>

²¹ FRNSW 2024: <https://www.fire.nsw.gov.au/incident.php?record=rec19mr6yzVvSQgQ0>

²² Australian Institute for Disaster Resilience (2023) Major Incidents Report 2022–23. https://knowledge.aidr.org.au/media/10344/aidr_major-incidents-report_2022-23.pdf

AFAC, through its ARET working group currently supports and liaises regularly with the Fire and Rescue NSW led research program Safety of Alternative and Renewable Energy Technologies (SARET). The research and testing program includes four main projects:

1. Fire service response to lithium-ion battery fires
2. End-of-life lithium-ion battery hazard management
3. Electric vehicle fires in structures
4. Fire propagation in battery energy storage systems

To better manage the issues and risks related to lithium-ion battery fires and to assess the efficacy of mitigation and response measures, FRNSW, on behalf of other fire and emergency services in Australia is leading a collaborative research program into the Safety of Alternative and Renewable Energy Technologies (SARET). The research and testing program is currently focused on fire service response to LiB fires and intends to investigate the operational impact of the end-of-life LiB hazard.

The program aims to inform operational procedures, new equipment and training for firefighters and fire safety requirements for buildings and infrastructure housing alternative and renewable energy technologies.

The SARET program has received initial seed funding support from the Australian Building Codes Board (ABCB) and the NSW Government. It also has a number of industry sponsors providing products for inclusion in the testing program, and other key stakeholders offering in-kind support.

Ongoing research will assist fire and emergency service organisations across Australia in actively supporting the clean energy transition. All AFAC member agencies are committed to ensuring the safety of firefighters, emergency responders and the public by prioritising research to inform prevention and education, and to prepare our people for any response. The SARET initiative is a means to overcome the shortfalls, avoid duplication of effort, and maximise our research output and return.

AFAC recognises and supports Australia's transition to sustainable forms of energy. AFAC also implores policy makers to ensure appropriate safety measures are developed, maintained and regulated to reduce the risk to communities and first responders.

APPENDIX 1: AFAC MEMBER ORGANISATIONS

Full Members (35)

Australian Capital Territory

ACT Emergency Services Agency
ACT Parks and Conservation Service

New South Wales

Fire and Rescue NSW
NSW Rural Fire Service
Forestry Corporation of NSW
NSW National Parks and Wildlife Service
NSW State Emergency Service
Surf Life Saving New South Wales

New Zealand

Fire and Emergency New Zealand Whakaratonga Iwi

Northern Territory

Northern Territory Fire and Rescue Service
Northern Territory Emergency Service
Bushfires NT

Queensland

Queensland Parks and Wildlife Service
Queensland Fire Department
Queensland Police Service (SES)

South Australia

Department for Environment and Water (National Parks and Wildlife Service)
South Australian Fire and Emergency Services Commission
South Australia Country Fire Service
South Australian Metropolitan Fire Service
South Australian State Emergency Service

Tasmania

Sustainable Timber Tasmania
Parks and Wildlife Service
Tasmania Fire Service
Tasmania State Emergency Service

Victoria

Country Fire Authority
Forest Fire Management, Department of Energy, Environment and Climate Action
Fire Rescue Victoria
Emergency Management Victoria
Parks Victoria
Victoria State Emergency Service

Western Australia

Department of Fire and Emergency Services

Department of Biodiversity Conservation and Attractions, Parks and Wildlife Service

National

Air Services Australia

National Emergency Management Agency

Parks Australia

Affiliate members (2)

Ambulance Tasmania

Australasian Road Rescue Organisation

Australian Civil-Military Centre

Australian Maritime Safety Authority

Australian Red Cross

Brisbane City Council

Bureau of Meteorology

Council of Australian Volunteer Fire Associations

Department of Conservation Te Papa Atawhai New Zealand

Geoscience Australia

Hong Kong Fire Services Department

HQPlantations Pty Ltd

Melbourne Water

National Emergency Management Agency Te Rākau Whakamarumaruru New Zealand

National SES Volunteers Association

NSW Department of Primary Industries

NSW Environment Protection Authority

Pacific Islands Fire & Emergency Services Association

Royal Flying Doctor Service, Western Australia

Surf Life Saving Australia

VRA Rescue NSW

APPENDIX 1: ABOUT AFAC AND ITS ROLE

AFAC is the National Council for fire, land management and emergency service authorities in Australia and New Zealand. AFAC represents 35 members and 21 affiliate members comprising permanent and part-time personnel and volunteers, totalling approximately 288,000 firefighters and emergency workers. The list of AFAC member organisations is provided in Attachment 1.

AFAC supports the sector to create safer, more resilient communities. We drive national consistency through collaboration, innovation and partnerships. We deliver enhanced capability by developing doctrine and supporting operations. AFAC has no direct role in the delivery of services to the community. AFAC also currently plays no role in representing its members in industrial matters.

Through our [collaboration model](#), which encompasses 34 groups, technical groups and networks, AFAC assists the emergency management sector to identify and achieve strategic priorities. Collaboration occurs through sharing knowledge and exchanging insights, exploring opportunities and creating solutions. This approach enables AFAC members to consider common challenges, generate solutions, develop positions and inspire new directions in practice.

AFAC's most significant intellectual property asset is a suite of doctrine publications which articulates good practice based on the knowledge and experience of our members and informed by research where it is available. It is evidence-based, constantly reviewed and vested as the official view by the AFAC National Council and sector leaders.

AFAC representatives also lead the development on many Australian and International Standards Committees. AFAC and Standards Australia are signatories to a Memorandum of Understanding in the development and revision of standards relating to the management of fire related risks, fire protection and fire safety.

3.1 AFAC Strategic Directions

AFAC's work is guided by the [Strategic Directions for fire and emergency services in Australia and New Zealand 2022-2026](#). The Strategic Directions provide the fire and emergency services sector with a shared vision and a joint commitment to enhanced community resilience. It informs, clarifies intent and identifies the actions required at a national level for fire and emergency services in Australia and New Zealand. AFAC recognises that a collaborative approach is critical to achieving the Strategic Directions and gives fire and emergency services a national voice and broader impact, while enhancing collective capabilities.

The Strategic Directions are:

1. Supporting resilient communities through risk reduction
2. Providing a trusted response
3. Using credible and timely information and data
4. Safe, capable and diverse workforce
5. Informed by knowledge, innovation and research
6. Effective and transparent governance.

3.2 AFAC is a managing partner in the Australian Institute for Disaster Resilience

The [Australian Institute for Disaster Resilience](#) (AIDR) is the National Institute for disaster risk reduction and resilience. AIDR collaborates across sectors to strengthen the resilience of Australian communities to disasters. AIDR creates, grows, and supports a range of networks; provides opportunities for learning; development, and innovation; shares knowledge and resources to enable informed decision making and action; and facilitates thought leadership through national conversations.

AIDR is supported by its partners: the Australian Government National Emergency Management Agency, AFAC and the Australian Red Cross.

3.3 AFAC supports the National Resource Sharing Centre

AFAC established the [National Resource Sharing Centre](#) (NRSC) to develop and maintain the national Arrangement for Interstate Assistance (AIA); pursue collaboration opportunities with international jurisdictions; maintain the National Statement of Capability for Fire and Emergency Services and provide support, if requested, to jurisdictions involved in deployments. Its value has been clearly demonstrated in supporting the management of large-scale incidents by facilitating interstate and international deployments.

3.4 AFAC leads the Emergency Management Professionalisation Scheme

The Emergency Management Professionalisation Scheme (EMPS) exists to advance the cause of professionalisation in the practice of emergency management in Australia and New Zealand. Professionalisation is open to all emergency management personnel regardless of whether they are paid or volunteer, and regardless of the particular emergency management function they undertake.

EMPS provides an excellent example of a national approach for professionalisation in the industry.

3.5 AFAC are the custodian of the Australasian Inter-service Incident Management System (AIIMS)

AIIMS is the nationally endorsed system for managing incidents used by all fire, emergency service and land management agencies within Australia. AIIMS provides a common incident management system for all responding organisations and personnel, enabling seamless integration of activities and resources for the effective and safe resolution of any incident.

Through the application of AIIMS in training, exercising and incident response, people from fire and emergency services, government, not-for-profit agencies and industry have been able to build trust and confidence in each other's ability to work together and effectively manage the most challenging of incidents.

3.6 AFAC and the National Aerial Firefighting Centre

AFAC provides aerial firefighting resources on behalf of the states and territories.

The National Aerial Firefighting Centre (NAFC) is a business unit of AFAC formed in 2003 by the Australian states and territories, with the support of the Australian Government, to provide a cooperative national arrangement for the provision of aerial firefighting resources for combating bushfires.

NAFC coordinates the leasing of a national fleet of specialised firefighting aircraft on behalf of state and territory emergency services and facilitates the sharing of these aircraft between states and territories during the fire season. The collaborative arrangements for the national aerial firefighting fleet have been instrumental in protecting communities and saving lives and property over past bushfire seasons.

NAFC also provides national systems to service aerial firefighting. For example, ARENA is a ground-breaking information system developed collaboratively with states and territories to support effective management and administration of the fleet.