Inquiry into e-mobility safety and use in Queensland

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PROTECTING PUBLIC SAFETY

The Case for Banning E-Scooters and Similar Battery Powered Devices on Queensland Public Transport

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Executive Summary

Lithiumion batterypowered micromobility devices — including electric scooters (escooters), electric bicycles (ebikes), hoverboards, and other light electric vehicles (LEVs) — are increasingly popular in Queensland. While they offer convenience and environmental benefits, they also present a **serious and growing safety risk** when carried aboard public transport.

The core hazard lies in the **volatile nature of lithiumion batteries.** When damaged, poorly manufactured, overcharged, or exposed to heat, these batteries can enter thermal runaway — a self-sustaining chemical reaction producing intense heat, toxic smoke, and sometimes explosions. Fires of this type are **extremely difficult to extinguish,** can reignite hours or days later, and spread rapidly in confined spaces.

Evidence from New South Wales, Victoria, and overseas shows that these incidents are not hypothetical. Fires linked to escooters and ebikes have already occurred on trains, in stations, and in other public settings. NSW and Victoria are now actively considering bans on these devices aboard trains, trams, and buses. London Underground has already implemented such a ban.

Given the unique risks posed in enclosed, crowded public transport environments, Queensland should act decisively to prohibit these devices on buses, trains, and trams until robust national safety standards, import controls, and enforcement mechanisms are in place.

2. Background and Context

2.1 Growth of Micromobility

LEVs have surged in popularity in Queensland's urban centres, driven by:

- Affordable purchase and running costs
- Convenience for short trips and "lastmile" connections
- Environmental appeal as lowemission transport

Common devices include:

- Escooters (private and shared schemes)
- Ebikes
- Hoverboards and selfbalancing scooters
- Electric mobility scooters

2.2 Battery Technology

Most LEVs use **lithiumion batteries** due to:

- High energy density (more power in less space)
- Lightweight design
- Long cycle life

These batteries are also found in laptops, phones, and power tools — but LEVs typically use **larger capacity packs,** increasing the potential energy released in a failure.

3. The Hazard: Lithiumion Battery Fires

3.1 Thermal Runaway

Triggered by:

- Physical damage (e.g., impacts, drops, collisions)
- Overcharging or use of incompatible chargers
- Exposure to heat or moisture
- Manufacturing defects or poor-quality cells

Once initiated:

- Internal temperature rises uncontrollably
- Flammable electrolyte vapours are released
- Fire or explosion can occur
- Reaction is self-sustaining until all stored energy is released
- Batteries can reignite hours or days later

3.2 Fire Behaviour

- **Rapid escalation:** Fires can fully develop in seconds.
- **Toxic smoke:** Dense, harmful fumes impair visibility and breathing.
- **Suppression difficulty:** Conventional extinguishers are often ineffective; cooling is the only way to halt the reaction.
- **Reignition risk:** Even after apparent extinguishment, cells can flare up again.

4. Incident Data and Case Studies

4.1 New South Wales

- **114 lithiumion battery fires** attended by Fire and Rescue NSW in the first 7 months of 2024 — a **20% increase** year on year.
- Majority involved **escooters, ebikes, and portable batteries,** not electric cars.
- **Sydney Airport (2024):** Detached EV battery exploded, destroying 5 cars.
- **Train station fire (Sydney):** Linked to an emobility device.
- NSW Transport Minister: Considering a **temporary ban** on trains until regulations are strengthened.

4.2 Victoria

- **Melbourne Metro (2024):** Ebike fire on a train at Union Station led to full evacuation.
- Public consultation underway on banning LEVs from Metro and V/Line trains and coaches.

4.3 International

- **London Underground (2023):** Ban introduced after an ebike caught fire on a platform.
- **Global:** Over 390 verified battery fires worldwide since 2010 (EV Fire Safe).

5. Why Public Transport is Especially Vulnerable

- **Confined spaces:** Buses, trains, and trams limit escape routes.
- **Security risk:** These devices also pose a potential security risk, as their batteries could be deliberately misused in crowded public transport settings during major events such as the upcoming Brisbane Olympics.
- **Evacuation challenges:** Crowded services, tunnels, and bridges make rapid evacuation difficult.
- **Toxic smoke:** Fires produce dense, harmful fumes that spread quickly.
- **Suppression difficulty:** Battery fires are resistant to conventional extinguishing methods; often, the only option is containment.
- **Infrastructure damage:** Fires can disable rolling stock, damage stations, and disrupt entire networks.

6. Regulatory Gaps and Quality Concerns

- **No national battery safety standard** for imported LEVs.
- Many lowcost imports have **substandard battery management systems.**
- Unsafe modifications (e.g., aftermarket battery swaps) increase risk.
- Enforcement of safe charging/storage practices is minimal.

7. Precedent and Policy Alignment

- **NSW & Victoria:** Actively considering bans; citing public safety and evacuation difficulty.
- **London Underground:** Ban in place; clear public messaging on rationale.
- Aligning Queensland policy with other states would:
    - Provide consistency for passengers
    - Strengthen the case for national standards
    - Reduce crossborder confusion

8. Counterarguments and Responses

Claim: *Only lowquality or modified devices are dangerous.*
Response: Even premium devices can fail due to damage, misuse, or undetected defects. Transport staff cannot feasibly inspect devices at boarding.

Claim: *A ban would inconvenience commuters.*
Response: Passenger safety outweighs convenience. Secure storage and parkandride facilities can be provided near stations.

Claim: *Education alone is sufficient.*
Response: Awareness campaigns are valuable but cannot eliminate the risk of sudden, catastrophic failure in transit.

9. Recommendations

1. **Immediate prohibition** of escooters, ebikes, hoverboards, and similar battery-powered devices on all Queensland buses, trains, and trams.
2. **Public awareness campaign** on lithiumion battery risks, safe charging, and disposal.
3. **Interstate policy alignment** with NSW and Victoria.
4. **Advocate for national battery safety standards** and stronger import controls.
5. **Provide alternative facilities:**
   - Secure storage at major transport hubs
   - Designated parkandride areas for LEV users
6. **Ongoing review:**
   - Monitor incident data
   - Reassess policy if robust safety standards and compliance mechanisms are implemented

10. Conclusion

The risk posed by lithiumion battery fires in micromobility devices is **real, growing, and uniquely dangerous** in the context of public transport. Fires can ignite without warning, spread rapidly, produce toxic smoke, and are extremely difficult to extinguish.

With NSW and Victoria already moving toward bans, Queensland has the opportunity to act proactively — protecting passengers, staff, and infrastructure before a major incident occurs. A ban, combined with public education and advocacy for national standards, is the most effective way to mitigate this risk in the short term.

Apendix A - Technical Overview of Lithiumion Battery Chemistry and Failure Modes

A.1 Battery Composition

- Anode: Usually graphite; stores lithium ions during charging.
- Cathode: Commonly lithium cobalt oxide ($LiCoO_2$), lithium iron phosphate ($LiFePO_4$), or nickel manganese cobalt oxide (NMC).
- Electrolyte: Flammable organic solvent with dissolved lithium salts (e.g., $LiPF_6$).
- Separator: Thin microporous polymer film preventing direct contact between anode and cathode while allowing ion flow.
- Battery Management System (BMS): Electronic circuitry that monitors voltage, current, and temperature to prevent unsafe conditions.

A.2 How Lithiumion Batteries Work

- Charge: Lithium ions move from cathode → anode, storing energy.
- Discharge: Ions move back to cathode, releasing energy to power the device.
- Efficiency: High energy density allows smaller, lighter batteries for the same output.

A.3 Failure Modes Leading to Thermal Runaway

1. Mechanical Damage — crushing, puncturing, or deformation can cause internal short circuits.
2. Electrical Abuse — overcharging, overdischarging, or using incompatible chargers.
3. Thermal Stress — exposure to high ambient temperatures or direct sunlight.
4. Manufacturing Defects — poor quality control, contamination, or faulty BMS.
5. Water Ingress — moisture can cause corrosion and short circuits.

A.4 Thermal Runaway Process

- Initiation: Internal short circuit or external heat raises cell temperature.
- Propagation: Heat triggers breakdown of electrolyte and electrodes, releasing flammable gases.
- Escalation: Adjacent cells heat up, causing a chain reaction.
- Outcome: Fire, explosion, toxic smoke; possible reignition hours or days later.

Appendix C — Risk Matrix: LEV Battery Fires vs Other Onboard Hazards

Hazard Type	Likelihood (Public Transport	Severity	Containment Difficulty	Passenger Evacuation
LEV LithiumIon Battery Fire	Medium–High (increasing with	Extreme	Very High — resistant to	Severe — toxic smoke, rapid
Engine Fire (Diesel Bus)	Low	High	Moderate — suppression	Moderate
Electrical Fault (Train)	Low–Medium	Medium	Low–Moderate	Moderate
Passenger Medical	Medium	Low	N/A	Low–Moderate
Small Luggage Fire	Low	Medium	Low–Moderate	Low–Moderate

Key Insight: LEV battery fires combine high severity with high containment difficulty, making them uniquely dangerous compared to other onboard hazards.

Appendix D — International Policy Responses

London Underground (UK):

- Full ban on escooters and ebikes after platform fire in Jan 2023.
- Applies to folded devices; exceptions only for certified mobility aids.
- Public signage and announcements explain rationale.

New York City (USA):

- Stricter import controls and disposal programs for unsafe ebike batteries.
- Public awareness campaigns targeting delivery riders.
- Proposed licensing for commercial ebike operators.

Hong Kong MTR:

- Prohibits carriage of escooters and large batterypowered devices on trains.
- Enforcement through station checks and fines.

Singapore:

- Ban on nonUL2272certified personal mobility devices on public paths and transport.
- Mandatory fire safety certification for all devices sold.