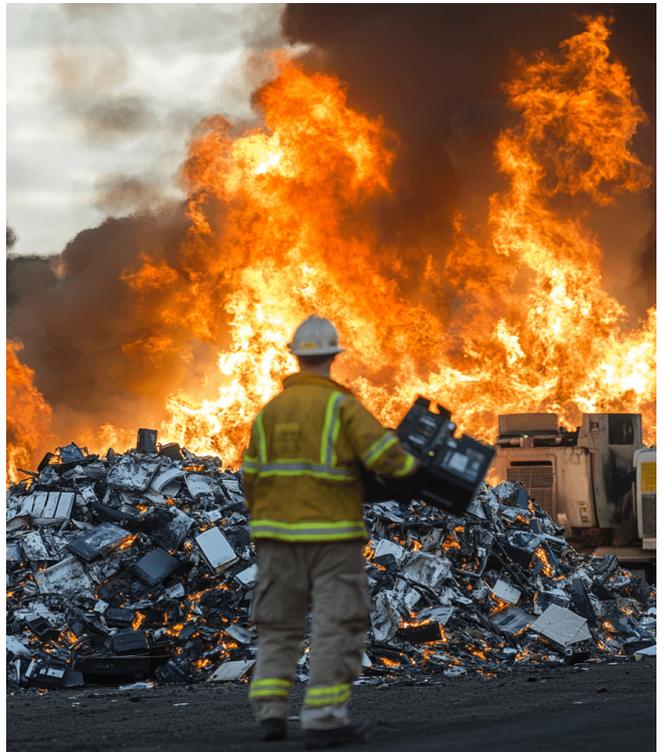


# Management of End-of-Life Lithium Batteries

## Share Lessons Learned Report



November 2025

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*WRIQ's Management of End-of-Life Lithium Batteries project is proudly funded through the Queensland Government's Department of the Environment, Tourism, Science and Innovation.*



# Executive Summary

Lithium-ion batteries have become one of the most urgent safety and environmental challenges facing Queensland's waste and recycling sector. Fires are now reported daily, costing more than \$87 million each year, destroying vehicles and infrastructure, and putting frontline workers at risk. At the same time, recovery rates remain extremely low, with most batteries ending up in kerbside bins.



This project has shown that progress can be made when government, industry, and community work together. Over twelve months, Waste Recycling Industry of Queensland (WRIQ) and our partners built the strongest evidence base yet, tested new innovations, delivered a state-aligned education campaign, and developed practical tools such as the Queensland Fire and Rescue Service Hot Load Procedure and tailored insurance solutions.

The lessons are clear. Batteries must be kept out of kerbside bins. Collection infrastructure must be expanded. Education must be continuous and supported by convenience. Innovation pipelines must be scaled beyond pilots.

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Collection infrastructure must be expanded.  
Education must be continuous and supported by convenience.  
Innovation pipelines must be scaled beyond pilots.**

## Our Project

Lithium-ion batteries are embedded in everyday items from phones and vapes to e-scooters and power tools. Fires caused by their incorrect disposal are now the most serious safety risk in the sector. Queensland experiences around 2,000–2,400 fire incidents each year, costing more than \$87 million. Insurance is becoming unaffordable or unavailable, and recovery rates sit at just 15%.

Low recovery rates leave thousands of tonnes entering the wrong waste streams each year, with household waste audits confirming 95% of waste and recycling trucks contain batteries or battery-powered items. This creates an unacceptable fire risk and reduces recovery of valuable materials such as lithium, cobalt and nickel.

To respond, WRIQ delivered a four-stage project (October 2024–November 2025), funded by the Department of the Environment, Tourism, Science and Innovation (DETSI):

- STAGE 1** Build evidence through existing industry knowledge, including waste audits.
- STAGE 2** Launch an Innovation Challenge to trial solutions.
- STAGE 3** Deliver materials for a statewide education and awareness campaign.
- STAGE 4** Share lessons and practical tools for industry, government, and community.

WRIQ’s role was to convene a forum for frontline operators, government agencies, and innovators to collaboratively tackle the issue. Partners included councils, major waste operators, innovators, Queensland Fire and Rescue Service, insurers, other industry associations and DETSI.

### 1.1 Industry Access Report

The first stage of the project focused on building a strong evidence base from industry knowledge, previous reports, and concurrent studies. Fires caused by lithium-ion batteries have long been reported anecdotally, but reliable data has been limited. Recent work by **Waste Contractors and Recycling Association of NSW (WCRA) and Australian Council of Recycling (ACOR)**<sup>1</sup> estimates that between 10,000 and 12,000 battery-related fires occur nationally each year. Proportionally, this equates to 2,030–2,440 fires each year within Queensland, costing the sector more than \$87 million according to the **Industry Access Report**<sup>2</sup>.

Most incidents occur in collection vehicles and transfer stations, where compaction creates ideal conditions for thermal runaway. Operators provided case studies of destroyed vehicles, damaged transfer stations, and long operational shutdowns. In one case, a truck fire spread to nearby vehicles before being contained. At a material recovery facility (MRF) in Canberra, a single embedded battery triggered a blaze that closed the site for weeks and required significant capital repairs. In Cairns, a Bedminster facility was destroyed by fire, leaving the entire North Queensland region without household waste diversion options.

Between late 2024 and early 2025, WRIQ worked with councils, major waste companies, technology providers, insurers, and frontline operators to map the current disposal pathways for batteries and battery-powered products. Engagement included stakeholder interviews, regional workshops, and a detailed analysis of fire incident data. To complement this, WRIQ commissioned an audit across 21 councils, inspecting more than 1,200 truckloads of general waste and co-mingled recycling.



On average 12,000 battery-related fires occur nationally each year



This equates to approximately

2,200

fires each year within Queensland at a cost of \$39k on average per fire



Costing the sector more than \$87 million



**95% contained batteries or battery-powered products**



**1,038**

**Battery drop-off points in Queensland**



**Only 15.3% collection rate**



**3,250**

**Tonnes of batteries uncollected each year**

The consequences extend far beyond fire damage. Insurance has become a critical flashpoint. Several operators reported losing coverage for high-risk facilities altogether. Others saw premiums and excesses rise so steeply that policies became ineffective. Insurers cited the absence of reliable data and the systemic nature of the risk as reasons for their withdrawal. Without cover, operators face severe business continuity risks. A single fire could bankrupt smaller firms or leave councils unable to provide essential services. This shifting insurance landscape has become one of the sector's most urgent challenges.

The waste and recycling sector faces a persistent and deeply concerning safety challenge linked to the improper disposal of batteries in household waste. While the industry delivers an essential public service – keeping communities clean, healthy, and sustainable – it operates under constant pressure to manage risks that are often beyond its direct control. Lithium and other batteries discarded in general waste or recycling bins can ignite during collection or processing, triggering dangerous fires in trucks and facilities. Despite rigorous safety protocols, training, and investment in technology, the unpredictable presence of these batteries means operators are continually assessing whether they are in breach of safety regulations simply by doing their jobs. This ongoing risk underscores the urgent need for stronger public awareness, better product stewardship, and clearer shared responsibility across the supply chain.

WRIQ's **Domestic Waste Audit** reinforced these risks at the household level. Of the 1,251 truckloads inspected, 95% contained batteries or battery-powered products. About half contained loose batteries, while the remainder held embedded cells in items such as vapes, toys, power tools, and small appliances. Only four loads were completely free of batteries. General waste presented the highest risk, with more than two-thirds of trucks containing loose batteries. Recycling loads also showed consistent contamination from

embedded products. Importantly, this pattern was consistent across all Queensland regions, confirming that the problem is systemic rather than localised.

Stakeholders also identified major system gaps. Queensland has around 1,038 battery drop-off points, translating to a collection rate of only 15.3%. Very few accept embedded batteries. Many councils refuse to take commercial business waste, and retailers often decline competitors' products due to liability concerns. This leaves an estimated 3,250 tonnes of batteries uncollected each year. Regional and remote communities are particularly disadvantaged, as servicing drop-off points can be cost-prohibitive. Queensland is the most decentralised mainland state in Australia, with more than half of the population living outside the Greater Brisbane region, which presents unique challenges regarding battery drop-off point infrastructure. Retailers raised issues with contamination, bin placement, and safety standards. Operators highlighted the lack of clear emergency procedures for drivers when fires break out in transit, as well as challenges with dangerous goods transport requirements.

Stage 1 delivered two critical contributions. First, it confirmed that lithium-ion batteries are the single largest safety risk facing Queensland's waste industry. Second, it identified systemic barriers — inadequate collection infrastructure, low public awareness, and shrinking insurance coverage — that must be addressed to reduce fire risks. These insights directly shaped the design of the Innovation Challenge, the Education and Awareness Campaign, and the draft Hot Load Procedure developed with Queensland Fire and Rescue Service.

Stage 1 made clear that batteries represent a severe and urgent problem across both household and commercial waste streams. The economic cost is already substantial, and immediate action is required. This foundation provided the credibility and focus needed for the later stages of the project to deliver real change.

1. Australian Council of Recycling; Waste Contractors & Recyclers of NSW, Industry survey: Battery Fires in waste & recycling, June 2024  
 2. Waste Recycling Industry Queensland; Delivering for Queensland, Management of End-of-Life Lithium Batteries Industry-led Action Project,

## 1.2 Innovation Challenge

Stage 2 was designed to put innovation into practice. While Stage 1 created the evidence base, Stage 2 activated new ideas and tested solutions to reduce lithium-ion battery risks in Queensland’s waste and recycling system.

The Innovation Challenge launched in early 2025 with strong national and international interest. WRIQ received applications from technology providers, researchers, and innovators. From these, 12 finalists were selected against criteria including:

- potential to reduce fire risks and improve safety,
- feasibility in real-world operations,
- scalability across Queensland and beyond, and
- alignment with DETSI and industry priorities.

A judging panel of seven industry specialists oversaw the process. All panel members managed waste facilities directly impacted by battery fires, ensuring selected projects were practical and operationally relevant.

Each finalist was paired with an industry host to test solutions in working environments. Partnerships included:

**ENCAPS** with **ResourceCo**

**Li-ion Energy** with **Remondis**

**VisionHQ** with **Remondis**

**Detection Dog School** with **Cleanaway**

**Draeger** with **JJ’s Waste & Recycling**

This model enabled immediate collaboration. Innovators gained operational insight, while waste operators trialled solutions they would not otherwise access.

**The solutions demonstrated strong diversity, including:**



**AI-driven detection and suppression systems**



**Recycling and reuse technologies**



**Fire prevention via encapsulation**



**Digital monitoring and safety platforms**



**Biological detection using trained dogs**



**Applied circular economy research**



### Several pilots emerged as highlights

ENCAPS and ResourceCo trialled a system to encapsulate batteries and prevent thermal runaway. Remondis hosted Li-ion Energy to advance recycling pathways. VisionHQ worked with Remondis to apply digital monitoring that identifies early signs of battery fire. Each case showed clear potential for scalable outcomes.

The Challenge culminated in a Showcase Event in October 2025. Finalists and their industry hosts presented progress in a standardised format covering the problem, pilot activity, evidence, safety considerations, commercialisation pathways, and benefits for Queensland. This provided DETSI and government with a transparent view of the innovation pipeline.

**The Challenge proved valuable in surfacing ideas, fostering collaboration, and demonstrating practical solutions. Pilots showed promise, but scaling requires dedicated adoption pathways and funding to move beyond proof-of-concept and embed solutions across the sector.**

### 1.3 Education and Awareness Campaign

Stage 3 recognised a fundamental truth: without behaviour change at the household level, even the best technologies cannot prevent lithium-ion batteries from entering kerbside bins. Fires begin with individual disposal decisions, so Stage 3 delivered a coordinated education and awareness program.

#### Campaign Design and Alignment

WRIQ, working with consultants The Other Dimension, developed campaign materials reviewed by DETSI. Activities were aligned with the Queensland Government's "Don't Bin Your Batteries" messaging, ensuring households received a consistent state-wide message and leveraging existing campaign recognition.

#### Behavioural Insights and Approach

Research confirmed that low awareness has driven unsafe disposal. Many households assumed "one battery" in the bin was harmless, or were unaware of drop-off points. Others found proper disposal inconvenient. Messaging reframed the issue as an immediate human safety risk — showing how a discarded battery can ignite a truck, endanger drivers, and disrupt essential recycling.

The campaign used both rational persuasion (data, fire incidents, insurance costs) and emotional persuasion (personal stories, community responsibility, the concept of a "Battery Boss"). This dual approach increased the likelihood of changing entrenched behaviours.

#### Creative Concept

The WRIQ developed video showed a discarded battery that sparked a fire in a collection truck showed the real-world consequences, then rewound to show safe disposal, protecting Hugh and his family. Supporting assets included truck-side signage, digital banners, social media clips, posters, and infographics — all with the core call to action: "Don't bin your batteries."



The campaign built stronger foundations for behaviour change, but ongoing reinforcement will be essential. Future opportunities include household incentives, grassroots programs, fireproof storage bags, and high-impact installations such as displaying burnt-out trucks.

#### Channels and Partnerships

The campaign used a wide mix of channels: council and industry websites, newsletters, social media, paid video ads, and truck fleets as moving billboards. Partnerships with councils, operators, retailers, and Queensland Fire and Rescue Service extended reach and authority. All assets directed households to the Recycle Mate website for disposal locations.



#### Foundations for Ongoing Change

Despite more than 1,000 Recycle Mate drop-off points, awareness remains low. The campaign built stronger foundations for behaviour change, but ongoing reinforcement will be essential. Future opportunities include household incentives, grassroots programs, fireproof storage bags, and high-impact installations such as displaying burnt-out trucks.

Stage 3 highlighted that education is not optional — it is a critical intervention. By reframing batteries as a safety issue, aligning government and industry under one message, and pairing education with convenience, the campaign has laid the groundwork for measurable behaviour change.

The lessons learned are clear: awareness campaigns must be emotionally resonant, practically supported, and continuously reinforced if they are to reduce the number of batteries entering kerbside bins and, ultimately, the number of fires across the waste and recycling network. We cannot continue to simply rely on funding organisations such as BCycle and retailers to educate the community about risks.



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## 1.4 Share Lessons Learned and Practical Tools

Stage 4 focused on embedding insights into tools and resources that could be shared across Queensland's waste and recycling network. This ensured benefits extended beyond early participants.

### Queensland Fire and Rescue (QFR) Hot Load Procedure

One of the most important outcomes was the Hot Load Procedure for collection vehicles, developed with input from QFR, WCRA NSW and WRIQ member feedback. It provides step-by-step guidance for drivers, supervisors, and mechanics during fires — covering safe stopping, extinguisher use, load ejection, incident reporting, and clean-up. The procedure also emphasises training and preparedness. Approved by QFR, it now offers consistent guidance for operators statewide.

### Insurance Solutions – Criterion Underwriting Partnership

Insurance was identified early as a critical gap. In 2025, WRIQ formed a partnership with Criterion Underwriting to create tailored products for waste operations. By linking insurers with new fire data, protocols, and innovation pilots, operators now have a pathway to more secure and affordable cover.

### Retail Engagement – National Retail Association

Stage 4 also engaged the National Retail Association to strengthen disposal messaging at point of sale. This work ensures that households receive clear, consistent advice when buying or returning battery-powered products, complementing the education campaign.

### Embedded Battery Solutions – Brisbane City Council Proposal

Embedded batteries remain a growing challenge. Brisbane City Council expressed strong interest in piloting dedicated battery drop-off weekends across its Resource Recovery Centres, modelled on green waste events. Although not trialled in this project, the proposal showed readiness for future industry-council collaboration.

### Training and Roadshow Presentations

To spread knowledge widely, WRIQ developed training resources and roadshow presentations for councils, operators, and government. These sessions shared best practices, demonstrated tools, and supported smaller operators with limited resources.

Stage 4 confirmed that the project delivered practical outcomes: the QFR Hot Load Procedure for frontline safety, insurance partnerships to restore cover, retail engagement to strengthen consumer interfaces, and training programs to extend benefits across the sector. These tools mean that lessons learned are not just recorded — they are actively embedded into Queensland's waste and recycling system.

**It provides step-by-step guidance for drivers, supervisors, and mechanics during fires — covering safe stopping, extinguisher use, load ejection, incident reporting, and clean-up. The procedure also emphasises training and preparedness.**

# Achievements

This project delivered clear, measurable outcomes across four stages:

<div style="text-align: center; margin-bottom: 10px;"> <span style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">STAGE</span>  <span style="font-size: 2em; font-weight: bold; display: inline-block;">1</span> </div> <p style="text-align: center; margin-bottom: 10px;"><b>Evidence Based</b></p> <hr/> <p>First reliable state-wide dataset confirming lithium-ion batteries as the single largest safety risk in Queensland’s waste and recycling sector.</p> <hr/> <p>Truck audits showed 95% of loads contained batteries, and fire incidents cost the industry more than \$87 million annually.</p> <hr/> <p>Insurance risk is quantified and recognised as a system-level challenge.</p>	<div style="text-align: center; margin-bottom: 10px;"> <span style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">STAGE</span>  <span style="font-size: 2em; font-weight: bold; display: inline-block;">2</span> </div> <p style="text-align: center; margin-bottom: 10px;"><b>Innovation Challenge</b></p> <hr/> <p>National and international interest generated with 19 applications and 12 pilots.</p> <hr/> <p>Successful pairing of innovators with major waste operators, testing solutions in real operating environments.</p> <hr/> <p>Practical outcomes demonstrated — encapsulation, recycling, AI monitoring, detection dogs, and advanced suppression technologies.</p> <hr/> <p>The Showcase event presented a transparent innovation pipeline to the industry and government.</p>	<div style="text-align: center; margin-bottom: 10px;"> <span style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">STAGE</span>  <span style="font-size: 2em; font-weight: bold; display: inline-block;">3</span> </div> <p style="text-align: center; margin-bottom: 10px;"><b>Education Awareness</b></p> <hr/> <p>State-aligned campaign under “Don’t Bin Your Batteries,” using consistent messaging across Queensland.</p> <hr/> <p>Creative campaign reframed batteries as a safety issue, emphasising driver risk and community consequences.</p> <hr/> <p>Assets were distributed widely through councils, operators, retailers, fire services, and media channels.</p> <hr/> <p>Direct households to Recycle Mate for disposal locations, increasing awareness of existing infrastructure.</p> <hr/> <p>A potential next step is to develop simple retailer-facing guidance and light training tools to strengthen consistent disposal messages at point of sale.</p>	<div style="text-align: center; margin-bottom: 10px;"> <span style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">STAGE</span>  <span style="font-size: 2em; font-weight: bold; display: inline-block;">4</span> </div> <p style="text-align: center; margin-bottom: 10px;"><b>Practical Tools</b></p> <hr/> <p>The QFR Hot Load Procedure was developed and approved, providing clear safety guidance for drivers and operators.</p> <hr/> <p>Partnership with Criterion Underwriting established to address insurance withdrawal from the sector.</p> <hr/> <p>Engagement with the National Retail Association strengthened consumer-facing disposal messaging.</p> <hr/> <p>A proposal from Brisbane City Council identified scalable opportunities for embedded battery disposal events which were later turned into a Queensland government funding announcement.</p> <hr/> <p>Training and roadshows delivered knowledge directly to operators, councils, and government representatives.</p>
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Together, these achievements provide Queensland with data, innovations, education, and tools that are ready to be scaled statewide and nationally.

# Broader Context and Policy Alignment

This project aligns directly with Queensland Government priorities due their fire risk, low recovery rates and prevalence in embedded products. WRIQ has also engaged with equivalent interstate associations where relevant, ensuring that Queensland’s work contributes to national consistency and shared learning.

**The State’s commitments include:**

	<p><b>\$2 million</b> in grants to expand collection points (including vapes and e-scooters)</p>		<p><b>Partnerships</b> with industry to reduce fire risks through practical solutions</p>		<p><b>Education</b> campaigns to change household behaviour</p>
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**The WRIQ project directly supported these commitments:**

 <p><b>Stage 1</b></p> <p>Provided data for informed investment</p>	 <p><b>Stage 2</b></p> <p>Tested innovations aligned with industry partnerships</p>	 <p><b>Stage 3</b></p> <p>Delivered an education campaign consistent with state messaging</p>	 <p><b>Stage 4</b></p> <p>Developed tools such as the QFR Hot Load Procedure and insurance pathways</p>
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The project also contributes to Queensland’s strategic recycling and diversion targets by reducing fire incidents, keeping facilities operational, and recovering more batteries.

Importantly, the project extends beyond Queensland. Lessons support the national move toward a mandatory product stewardship scheme, offering insights on fire data, operational safety, and behavioural levers. WRIQ and its partners (including other state associations) have demonstrated that coordinated industry-government action can deliver scalable results.

**Summary**

This project is not an isolated trial, but a demonstration of how state-level strategy and industry-led action can be mutually reinforcing. By addressing batteries as a priority risk, aligning with Queensland’s Waste Strategy commitments, and providing scalable tools, the project contributes both to immediate safety improvements and to the long-term circular economy goals of the State.

Nevertheless, alignment alone is not enough. The next phase of work will require further investment to scale successful pilots, expand safe disposal networks, and embed behaviour change across all regions.





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Government**