



Heavy Vehicle Safety Initiative Application



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1. Project Overview

1.1 The project

Our project seeks to enhance the safety in waste and recycling transportation and operations through the integration of RFID (Radio-Frequency Identification) technology. This project focusses on batteries – in loose or embedded form, an increasing alarming hazard within kerbside waste and recycling streams. The primary objective is to incorporate RFID technology into collection vehicles, tagging electronic items like batteries with RFID tags, and demonstrating the technology's effectiveness in identifying incorrectly disposed of hazardous items before transportation.

Equipping collection vehicles with advanced RFID scanning technology, we aim to prevent and create a strategy to detect the incorrectly disposed of hazardous waste items before they are transported. This integration will dramatically mitigate the occurrences of truck and facility fires, therefore significantly enhancing safety protocols and safeguarding lives.

The scope of our initiative extends to integrating RFID tags onto hazardous items, including but not limited to batteries. This strategic application enables us to identify and monitor these items throughout the item's lifecycle, from manufacturing to recycling. By tagging hazardous items with RFID tags, we can accurately detect their presence in the kerbside bin before they enter the collection vehicle and ensure they are correctly handled in accordance with regulatory guidelines.

At the core of this initiative is to demonstrate the efficacy and accuracy of RFID technology within the resource recovery sector. Through real-world tests and simulations, we will validate the capability of RFID technology to identify batteries and other hazardous materials within kerbside bins. The successful adoption of such measures promises to enhance collection and transportation processes, setting the standard for the expansion of this technology to encompass a wider spectrum of hazardous waste materials, inclusive of gas bottles and flares, thus reinforcing safety and risk management protocols.

In conclusion, our project represents a significant safety advancement in the waste and recycling stream. The integration of RFID technology onto collection vehicles and electronic items, we aim to improve efficiency, accuracy, and safety operations in the waste and recycling industry operations. Through successful implementation and demonstration, we envision a future where RFID technology plays a central role in optimising the waste and recycling management processes for various types of hazardous waste.

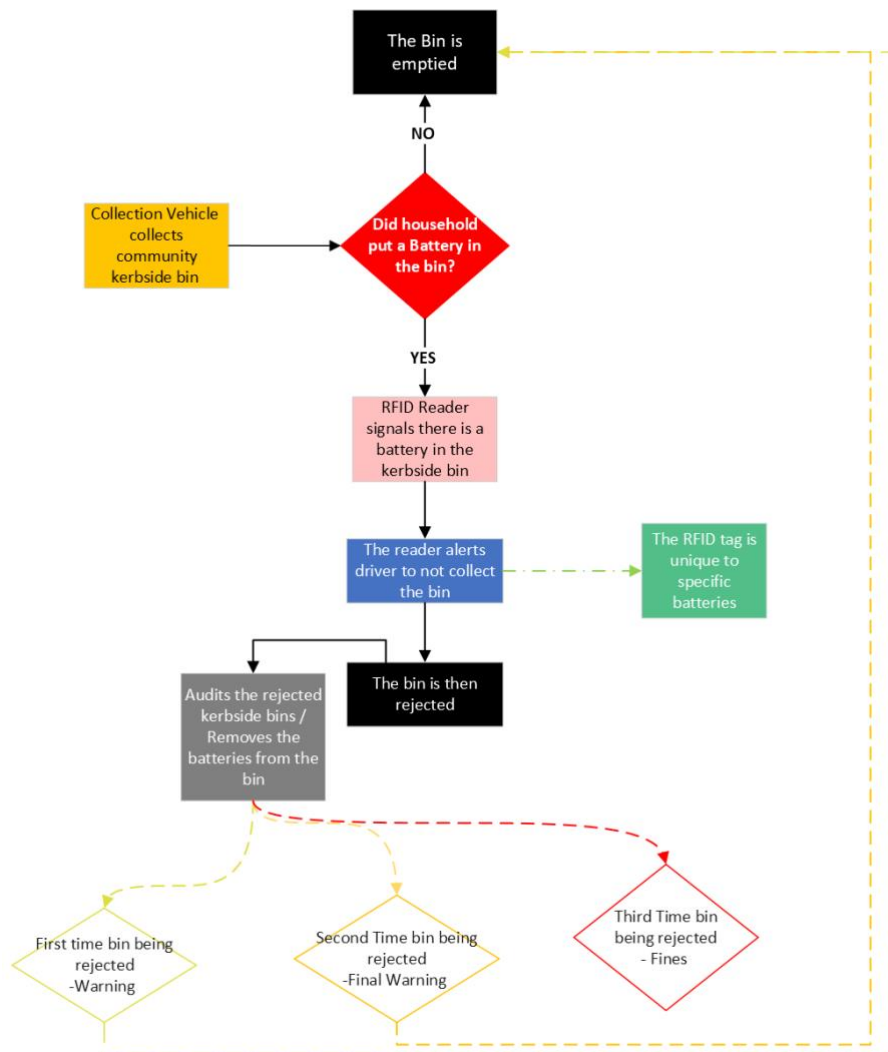
1.2 Costs

\$703,766. Grant Request \$465,766.

1.3 Benefits

This project is strategically structured to benefit the heavy vehicle industry and the waste and recycling sector, utilising RFID technology to identify batteries and hazardous items. It directly supports the safety of heavy vehicle operators, reducing fire-related emergencies that can lead to dangerous roadside incidents. This indirectly benefits the community and other road users by decreasing the likelihood of encountering hazardous situations such as collection vehicles ejecting 'hot loads' on residential and recreational areas, therefore safeguarding the broader public. Additionally, the initiative aids in stabilising insurance rates and encourages manufacturers to take responsibility for their products.

Figure 1: Battery Detection and Kerbside Collection Process



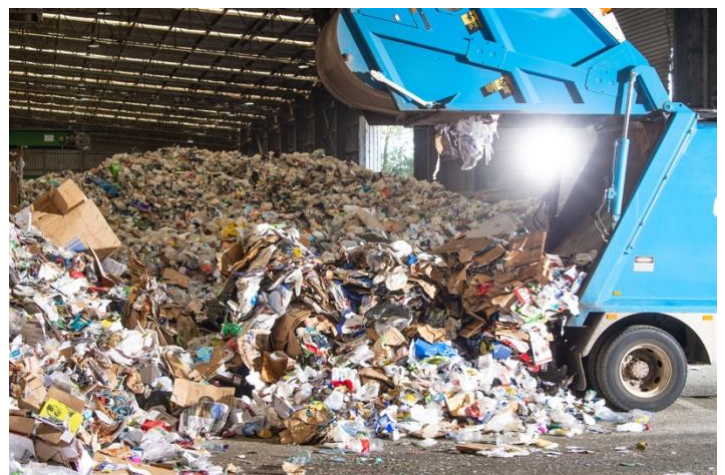
2. Organisation Capacity

iQRenew is an Australian recycling company. We aim to create the highest value recycling solutions for the community's recovered resources, including soft plastics, rigid plastics, glass, paper, and cardboard. These materials are recovered for re-use in new products as part of the pursuit of our vision, 'regeneration for future generations'. We operate a Material Recovery Facility on the NSW Central Coast, which recovers household 'yellow bin' recycling from over 1 million households. Our customers include Central Coast Council, Newcastle City Council, Tamworth Regional Council, and Sydney's Northern Beaches Councils.

We are committed to achieving true circularity of materials, by investing in and developing innovative recycling infrastructure. In line with our motto "Intelligent Australian Recycling", our commitment to building innovative local secondary materials has had a direct impact of reducing material being sent to landfill whilst simultaneously reducing our environmental footprint through reduced transportation requirements because of building infrastructure locally, reducing the need for lengthy intra and interstate movements. This commitment not only catalyses the expansion of our operational capabilities but also elevates the capabilities and volume of resources reclaimed from Australian households.

iQRenew has taken a leadership stance in addressing complex recycling challenges by presenting our project at an industry safety summit, an effort that was met with commendation and has solidified our position at the forefront of innovation. This initiative highlights our commitment to resolving the pressing issues within the recycling and resource recovery sector. Batteries are currently bereft of safe disposal methodologies in waste and recycling streams, thus necessitating our concerted drive for industry enhancement.

iQRenew currently operates across 6 sites within NSW and has direct daily interactions with multiple other sites. Our Glass recycling site in Wyong was the first of its kind in Australia and currently holds a patent on the technology developed to double wash



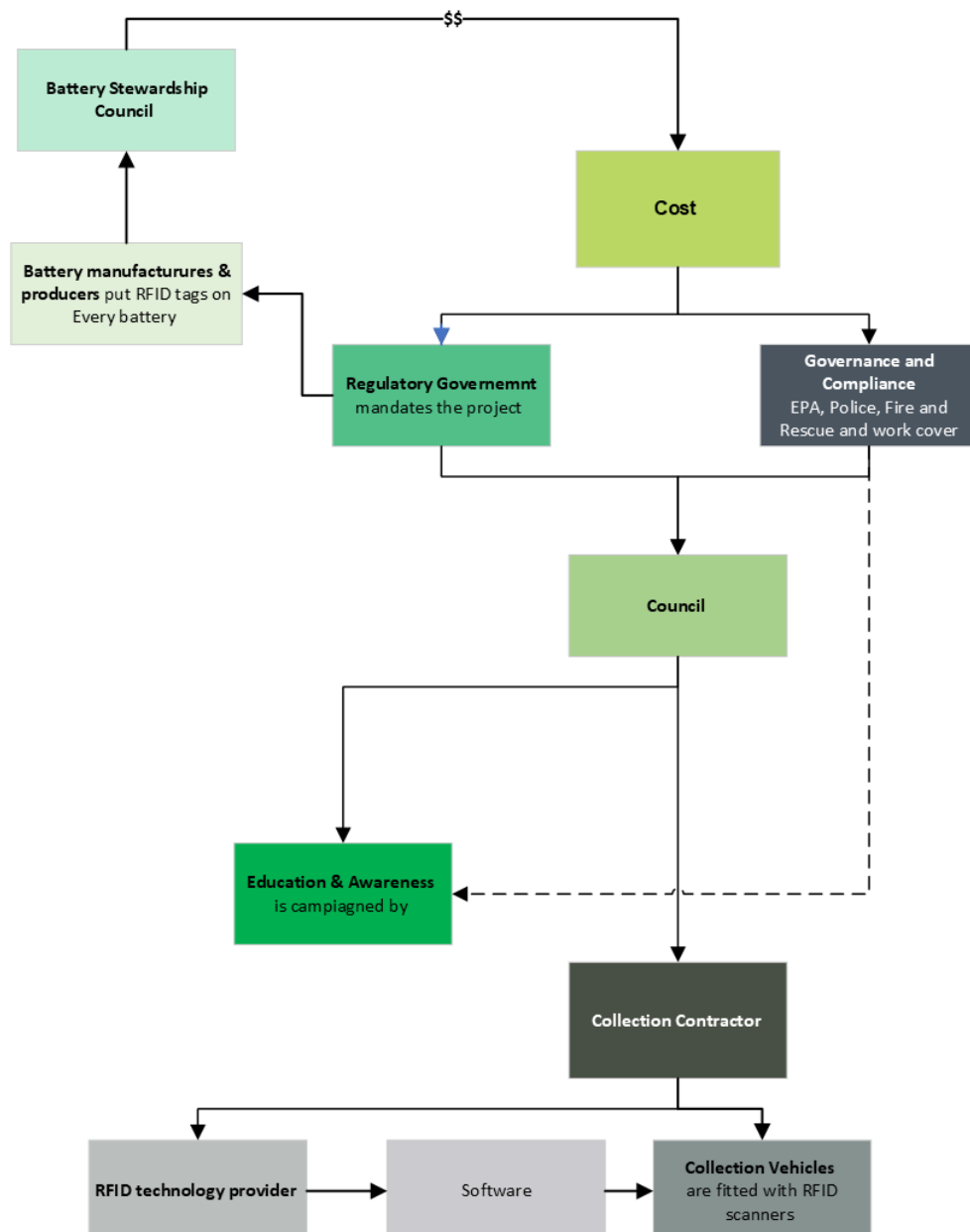
refined glass sand. Through the development of this technology iQRenew was able to assist the NSW Government transport infrastructure team to develop meaningful and achievable targets for the use of recovered commodities in the construction of NSW roads. A key strength that enabled the development of this technology was the inclusive culture within the organisation, from the CEO to the yard hands all suggestions and inputs are genuinely considered and trialled where feasible. This culture has developed an environment of critical thinking that ensures every day we are improving and reviewing our performance.

The inclusive nature of the iQRenew culture extends beyond the confines of the company and enables us to work collaboratively with all stakeholders, this can be demonstrated through our longstanding contracts with Cleanaway, Opal, Visy, Veolia, Infrabuild and many other recycling organisations. These relationships will be instrumental in the ongoing development of this initiative post the initial project completion.

3. Stakeholder Engagement Plan

Our Battery Project has secured a strong foundation of support, evident from the diverse range of support letters from key stakeholders such as Fire & Rescue NSW, recycling initiatives, and local government councils. These letters underscore our proactive engagement in addressing critical issues associated with battery management. They reflect confidence in our project's potential to drive innovation, enhance industry standards, and foster collaborative solutions across sectors. The growing collection of endorsements highlights the project's broad relevance and the commitment of various stakeholders to its success.

Figure 2: Battery Project - Stakeholder Flowchart



4. Community & Industry Education Component

4.1 Objective

Enhance public and industry awareness about the importance of proper disposal of batteries to prevent battery related fire incidents in the resource recovery streams. To utilise RFID technology to improve safety in waste collection and recycling operations.

4.2 Key messages

- Importance of safe battery disposal options for community and environmental safety.
- Introduction of RFID technology to identify, detect and manage hazardous waste effectively.
- Encourage community and industry stakeholders to participate in safe disposal practices.

4.3 Target audiences

Local community, schools, businesses, environmental groups, and the waste and recycling industry.

4.4 Workshops and seminars:

Organise a comprehensive awareness-rising and education campaign to inform the community of risks of batteries and other hazardous waste in kerbside bins. The education campaign has the potential to be implemented across multiple channels.

Work with industry bodies and emergency response personal to equip the industry workforce with knowledge and skills needed to respond adeptly to battery related fires.

4.5 Partnerships

Collaborating with local Councils, industry bodies, regulatory government, and environmental protection authorities to amplify the reach and impact of the campaigns.

5. Technology Specifications

5.1 Overview

Radio Frequency Identification (RFID) technology has previously been used in the waste and recycling industry, serving as a pivotal tool in transforming asset management and operational protocols. Its past application for tracking residential waste bins has established a foundation for meticulous sorting and accountability in waste management.

Recognising the effectiveness of RFID in past implementations, there is a compelling opportunity to expand these technologies capabilities to specially identify and detect the presence of batteries and other hazardous items in kerbside bins. By advancing RFID technology, we aim to detect and identify incorrectly disposed of batteries in kerbside bins, which is step forward in addressing the growing concern of battery related incidents.

5.2 System Components

RFID Tags:

RFID tags are a vital component of the battery project, enhancing the management of batteries through precise identification and data collection. By assigning specific RFID tags to batteries, each battery is uniquely identified, linking it to a particular location. This system utilises a predefined mask, such as "4ID17", to distinguish batteries from other RFID tags, ensuring accurate identification.

The RFID tags are programmed to contain essential data, including battery serial numbers, type of battery waste (e.g., Li-ion, NiMH), size, and other relevant details. This enables efficient detection of batteries, reducing the risk of improper disposal, therefore improving the safety and environmental risks.

RFID Scanners:

The utilisation of RFID scanners is paramount, as they provide a swift and precise method to capture data from RFID tags affixed to batteries. This swift data capture ensures an accurate and comprehensive identification process, leading to the effective management of battery life cycles. Incorporating RFID scanners into the waste collection and recycling infrastructure elevates safety measures by meticulously tracking and identifying batteries outfitted with RFID tags. This advanced level of monitoring strategically



Figure 3: UHF RFID Scanner

mitigates the incidence of fires caused by the inappropriate disposal of batteries, as the consumer is compelled to use the appropriate and safe disposal options.

Battery Detection and Alert interface

The use of an electronic device such as a tablet will be utilised for various purposes such as data collection, monitoring, communication, or operational control within the context of the project. Its role involves serving as an interface for managing the advanced algorithms and data from RFID technology used to identify and reject kerbside collections.

5.3 Integration with Waste Management Systems

Data Transmission and Management Software:

The RFID readers will transmit tag data to a centralised management platform, enabling monitoring and analytics. This platform will provide insights into battery disposal volumes, recycling rates, and operational efficiencies, safety protocols and compliance reporting.

5.4 Implementation Plan

The rollout of the RFID battery management system will be phased, starting with a pilot program in selected local government areas (LGA). This approach allows for fine-tuning the system, training staff, and gathering feedback for improvement. The plan includes detailed timelines, training programs for staff, and criteria for success evaluation.

5.5 Maintenance and Support

4ID Solutions and other technology providers will provide ongoing maintenance and support for the RFID system, ensuring its reliability and effectiveness. This support includes software updates, hardware maintenance, and technical assistance, guaranteeing the system's operational integrity over time.

6. Trial Overview

6.1 Objective

The Battery Project aims to evaluate the effectiveness of Radio Frequency Identification (RFID) technology in improving the safety, traceability, and responsible disposal of batteries, focusing specifically on lithium-ion batteries. This trial will use battery replica devices equipped with RFID tags to simulate the lifecycle of batteries from purchase to disposal.

6.2 Methodology

- A controlled trial involving the distribution of battery replica devices to preselected households on the Central Coast NSW. These replicas are designed to mimic real batteries but are equipped with RFID tags for identification.
- A project team member will dispose of the battery replicas into the selected kerbside bins. Collection vehicles equipped with RFID scanners will then attempt to identify the tagged replicas during collection.
- Data on the detection rate of RFID-tagged replicas, the accuracy of segregation, and any operational challenges will be collected and analysed.

6.3 Participants

The trial will involve a diverse group of participants, including households across various socioeconomic statuses from different cities across the Central Coast LGA.

6.4 Duration

The trial is scheduled to run for six months, from May 2025 to October 2025.

6.5 Outcomes

Preliminary results will focus on the detection and segregation efficiency of RFID technology in waste collection and processing stages. The findings will help assess whether RFID technology can significantly reduce the risk of battery-induced fires in waste management facilities and improve the traceability and responsible disposal of batteries.

6.6 Next steps

Upon the conclusion of the Battery Project trial, efforts will pivot towards harnessing the insights obtained to significantly reduce fire hazards associated with improper

battery disposal and to promote sustainable environmental practices. This next phase will be characterised by forging stronger collaborations with Fire and Rescue NSW, advocating for regulatory changes to mandate the use of RFID technology in battery manufacturing, and intensifying public and industry engagement to ensure widespread adoption of these safety measures. These strategic actions aim to transition from trial findings to tangible improvements in battery safety and environmental stewardship, supported by policy enhancements and collaborative efforts across sectors.

7. Project Need

This initiative is set to improve safety within the heavy vehicle industry by addressing the overwhelmingly increasing risks associated with the inappropriate disposal of batteries and items containing embedded and sealed batteries. The improper disposal options and poor consumer education is severely comprising the collection and resource recovery operations for recyclers across Australia.

The core of our project is to integrate RFID technology. By equipping heavy vehicle collection trucks with RFID scanners and embedding batteries with RFID tags, we can accurately identify and segregate batteries during kerbside collections. This strategic approach drastically reduces the fire hazards posed to heavy vehicles operating within the waste and recycling industry.

In safeguarding the health and safety of drivers and workers, this initiative extends beyond immediate risk mitigation. It acts proactively to protect the valuable infrastructure of the recycling and resource recovery sectors and mitigates the environmental impact of hazardous waste. The deployment of this technology is a testament to our commitment to advancing industry standards, ensuring a safer working environment, and fostering sustainable waste management practices.

Our project confronts the critical issue of battery-related fires in the heavy vehicle industry, where a significant 27% increase in such fires in collection vehicles and a 55% rise in facility fires were reported by Fire and Rescue NSW in 2023. The introduction of RFID technology targets the safe handling and disposal of batteries, aiming to improve safety immediately and foster long-term responsible practices. The reported statistics likely underrepresent the true scope of the issue, highlighting the project's importance in protecting heavy vehicle drivers and other road users from the dangers of inappropriate battery disposal.



*Figure 4: collection truck on fire
Source: Waverly Council*

8. Ongoing Funding strategy

The RFID technology project aims to secure funding through a multi-faceted approach, incorporating grants, fines, levies, and taxes. Users who improperly dispose of batteries face fines after three rejections, fostering responsible behaviour while generating revenue.

The Recycling and Waste Reduction Act 2020, requires manufacturers, importers, and distributors to take greater responsibility for used batteries. All these organisations have equal responsibility to address the issues caused by batteries and should be required to contribute to this scheme either directly or through the Existing Battery Stewardship Council Mechanism.

The project requires financial support from stakeholders and access to grant funding for the early stages of feasibility studies and system development with a view to transition to EPR (extender producer responsibility) /levy/tax based fully funded program for a full-scale program.

9. Conclusion

In conclusion, addressing the critical issue of battery fires in waste and recycling streams requires a comprehensive and forward-thinking approach that leverages technology and regulatory measures. The implementation of a mandate by the government, in collaboration with the National Heavy Vehicle Regulator (NHVR), to require all batteries to be transported with RFID technology represents a significant step forward in enhancing safety, traceability, and environmental protection.

This initiative not only aligns with the broader goals of sustainable waste management and recycling but also positions the government and NHVR as leaders in adopting innovative solutions to address complex challenges. By enforcing the use of RFID technology, we can significantly reduce the risks associated with the improper disposal and transportation of batteries, thus mitigating the incidence of fires that pose threats to public safety, the environment, and the recycling industry's infrastructure.

Furthermore, this policy sets a precedent for the responsible management of hazardous materials, encouraging manufacturers, retailers, and consumers to adopt practices that contribute to a safer and more sustainable future. It also promotes the development and integration of advanced technologies in waste management, opening new avenues for efficiency and compliance monitoring.

As we move forward, it will be crucial for all stakeholders, including local governments, waste and recycling industry players, and technology providers, to collaborate closely to ensure the successful implementation of this mandate. Education and awareness campaigns will play a vital role in facilitating this transition, ensuring that the benefits of RFID technology in battery transportation are widely understood and embraced.

In summary, the leadership shown by the government and NHVR in mandating the use of RFID technology for battery transportation marks a pivotal moment in our journey toward safer and more environmentally responsible waste management practices. This initiative not only addresses the immediate challenge of battery fires but also lays the groundwork for the adoption of innovative solutions that will drive the waste and recycling industry towards a more sustainable and efficient future.