Solving the problem of battery waste

June 21 2022

Credit: Unsplash/CC0 Public Domain

The increased uptake of electric vehicles (EVs) and home batteries comes with its own environmental and sustainability problem—what to do with the batteries at the end of their lifespan?

As climate change and the decline of fossil fuels accelerate, many

Australians are installing home batteries to store solar power and choosing electric cars to help reduce emissions and protect the environment.

However, this creates a new problem—how to recycle used batteries in a safe and environmentally sustainably way and reuse their valuable components?

Sending lithium-ion batteries (LIBs) used in electric cars, most electronic devices and solar batteries to landfill can harm the environment and surrounding communities in several ways, from toxic emissions to fires. Incorrect disposal of LIBs in general waste or recycling bins can lead to fires during transportation or at recycling centers.

That means the ability to effectively recycle LIBs is important for the environment and the development of a circular economy, but LIB recycling companies face a bewildering array of differing regulations across Australia covering everything from transport and storage to safety labeling and waste disposal.

Solving the problems of how best to recycle LIB batteries, and how to create them in the first place using circular economy principles, is occupying researchers from Deakin University's Institute for Frontier Materials (IFM) and the University's School of Engineering.

A study undertaken by mechatronics engineering student Liam Digby under the supervision of Professor Bernard Rolfe and IFM's Dr. Jingsi Jiao earlier this year found increased use of electric vehicles (EVs) in Australia could result in around 180,000 tons of LIB waste by 2036 and a $2.9 billion loss to the economy.

Mr. Digby's research found that, despite this, the Australian industry lags

behind its international counterparts.

In 2017–2018, only around 6% of LIBs were collected in Australia, compared to a 50% collection rate across Europe. A lack of collection and transportation infrastructure in Australia means it's difficult to obtain sustainable volumes of LIB waste, making recycling an unprofitable business model. Gaps in research surrounding the financial feasibility and life cycle assessment of LIBs in Australia make investment risky without a clear projection of the future industry.

"As we undergo the transition from internal combustion engines to EVs it's inevitable that everyday Australians will be impacted on both a personal and national level," Mr. Digby says.

"We wanted to know what action is required to alleviate the financial and environmental implications."

Mr. Digby's report investigates the current state of the Australian LIB supply chain and explored economic models for LIB recycling. It also offers suggestions for government and industry actions and community education.

"It's essential to educate people about how they can approach the transition to EVs to ensure a more environmentally and economically conscious future," Mr. Digby says.

"We hope our research can help to create a circular economy conscious community."

IFM's Dr. Timothy Khoo says sending batteries to landfill not only risks leaking toxic materials into the environment but is also a huge waste of valuable resources.

"Ninety-five percent of a battery's components can be reused for new batteries or used in other industries," he says.

In response to industry calls for more to be done to strengthen and streamline the regulatory framework, especially regarding product quality, transport and waste tracking, IFM researchers and industry partner Australian Battery Recycling Initiative (ABRI) set out to create a framework for guidelines on recycling mixed batteries and help industry navigate the different requirements from state to state.

"The speed of transition for both electric vehicles and home energy storage has caught Australia's emerging battery recycling industry and regulators by surprise. We need to find the best tools to safely and sustainably manage these new technologies," says ABRI CEO Katharine Hole.

"Industry and consumers want clarity to be able to answer questions such as: what material have I got, how do I store it, and how do I move it?

"Standardized management of new and used battery tracking will support improved transparency and deliver a trusted source of data to inform future policy work," she says.

Headed by Ph.D. students Greg Rollo-Walker and Anna Warrington from the Deakin-led ARC Training Centre for Future Energy Storage Technologies (storEnergy) and Benny Roff and Evelyn Zhang from Deakin Law School, the project focused on used lead-acid batteries, an area Australia has experience in recycling, and household waste batteries, including LIBs.

The research team investigated how used batteries are classified under different laws from environment protection to health and safety to dangerous goods and interviewed representatives from industry including

the Battery Stewardship Council, Ramcar, Envirostream and ReSource.

The result is an industry guide for recycling older and new technology batteries that answers questions such as what licenses are needed for transporting batteries and how they should be stored safely.

The next step will be to test the program with industry, continue to develop the guide and expand it to cover other battery types.

"I see three main areas that need to be addressed to improve battery recycling in Australia," Mr. Walker says.

"These are education of the consumer; providing concise instructions and drop-off locations; and ensuring recyclers can do their job safely without getting lost in the regulatory maze for transport and storage of these devices."

"While the project has helped to unravel the existing procedures and provide a clearer picture for industry, it's also providing valuable training to the next generation of energy researchers and regulators," Dr. Khoo says.

"The law students are gaining knowledge about the scientific side of environmental regulation and how difficult that is to translate into a regulatory framework, while the Ph.D. researchers have gained an understanding how science is interpreted from a legal and regulatory perspective."

Provided by Deakin University

Citation: Solving the problem of battery waste (2022, June 21) retrieved 16 April 2024 from https://techxplore.com/news/2022-06-problem-battery.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.