PRESS RELEASE

Electric vehicle batteries – Prioritize reuse before recycling

A research team from the University of Münster, the Fraunhofer Research Manufacturing Battery Cell facility, and Lawrence Berkeley National Laboratory (USA)has analyzed different strategies for handling end-of-life batteries from electric vehicles, using California as a case study. The findings show that repurposing used batteries as stationary energy storage systems is more effective in reducing greenhouse gas emissions over the long term than immediate recycling. Especially in countries with a high share of renewable energy, second-life battery use, such as for power grid stabilization and improved integration of solar and wind power, holds significant potential.

Münster. When electric vehicle (EV) batteries reach the end of their service life, they can be recycled to recover valuable raw materials for the production of new batteries. Alternatively, retired EV batteries can be repurposed for use as stationary energy storage systems, helping to integrate renewable energy into the power grid, manage peak loads, and enhance energy security. Both recycling and second-life use are based on principles of circular economy. But which option is preferable immediate recycling or second-life use?

To answer this question, researchers from the University of Münster (Germany), the Fraunhofer Research Institution for Battery Cell Production FFB (Germany), and the Lawrence Berkeley National Laboratory (USA) conducted a study using California as a case study. The researchers found that deploying end-of-life EV batteries as stationary energy storage devices is more effective in reducing greenhouse gas emissions than immediate recycling. They therefore recommend that countries with a high percentage of renewable energies should prioritize the reuse of retired EV batteries as stationary energy storage devices before recycling.

Circular economy with high savings potential

The calculations indicate that approximately 61 percent of the demand for EV batteries in California could be met by 2050 if all end-of-life EV batteries are recycled, with no second-life use. This approach would also save around 48 million tons of carbon dioxide. In contrast, prioritizing reuse of EV batteries would save 56 million tons of carbon dioxide emissions. The findings further reveal that by 2050 the volume of end-of-life EV batteries will significantly exceed the demand for stationary energy storage systems in California. Utilizing only lithium iron phosphate batteries, which are particularly well-suited for stationary storage would be sufficient to meet this demand by 2050. Therefore, the authors recommend the state start developing a recycling infrastructure early, even if second-life use is initially prioritized.

Contact
Vorname Nachname | Fraunhofer Research Institution for Battery Cell Production FFB |
+49 Tel. | E-Mail | https://www.ffb.fraunhofer.de/en.html

Systemic circular planning as a success factor

The results highlight the importance of holistic, systemic planning for battery supply chains, encompassing production, recycling, and second-life applications. Countries that proactively start building these entire systems at a regional level and align their infrastructure with future demand for battery materials will be better positioned to reap the benefits of the circular economy for EV batteries.

Recycling and secondary use compared for the first time

Previous research has shown that producing EV batteries with recycled materials generates fewer greenhouse gas emissions than using primary (mined) raw materials. It is also well established that reusing end-of-life EV batteries in stationary energy storage systems results in significantly lower emissions compared to manufacturing new batteries from primary materials. However, until now, no study had systematically compared these two approaches.

Methodological approach

In the study "Recycling or Second Use? Supply Potentials and Climate Effects of End-of-Life Electric Vehicle Batteries," the researchers modeled three scenarios based on various parameters (e.g., emissions, efficiency of recycling processes, sales figures, and battery life) and compared them. In the "baseline scenario," they started with the actual, current figures: 2.5 percent of used batteries from electric vehicles are initially reused as stationary energy storage devices, while all others are recycled immediately. In the "recycling scenario," all used batteries from electric vehicles are recycled, with no secondary use. In the "reuse scenario," used batteries from electric vehicles are prioritized for reuse until the demand for stationary energy storage is completely covered by used batteries. The remaining used batteries are recycled. The study is freely available in the scientific journal **»Environmental Science & Technology«.**

Scientific Contacts:
Prof. Dr. Simon Lux
Director
Fraunhofer Research Institution for Battery Cell Production FFB
Bergiusstraße 8
48165 Münster, Germany
E-mail: simon.lux@ffb.fraunhofer.de

Prof. Dr. Stephan von Delft
University of Münster, Institute of Business Administration at the Department of Chemistry and Pharmacy
Leonardo-Campus 1
48149 Münster
Phone: +49(0)251 83-31810 (Office)
E-mail: stephan.vondelft@uni-muenster.de