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The Problem Child of the Second Life Battery Market

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The industry of repurposing second life batteries is still very young and evolving. As much research and repurposing efforts have focused on larger electric vehicle batteries thus far, insignificant efforts or projects have been undertaken on smaller electric scooter batteries. As the micromobility industry expands, so will the industry of its second life batteries. Why is it that second-life batteries from electric scooters have been overshadowed by larger battery systems? And why aren´t the scooter fleets further ahead in their strategies for end of life management of their batteries? This article will address some of the challenges and possibilities associated with the electric scooter battery, referred to as 'The Problem Child', as well as initial suggestions of concepts for applications that repurposers could build with these batteries.

The green transition taking place in the world has put pressure on securing energy storage from renewable sources like solar and wind. Batteries are key to contributing to this availability of energy but require a lot of resources to build. Resources that are laboursome and intensive to extract. Batteries from vehicles that reach end of life still contain a lot of usable energy for other, less demanding applications. A lot of work is therefore being done on repurposing electric vehicle batteries to stationary storage. Less is to be found however on batteries from electric scooters, which is a growing market around the world, how come?

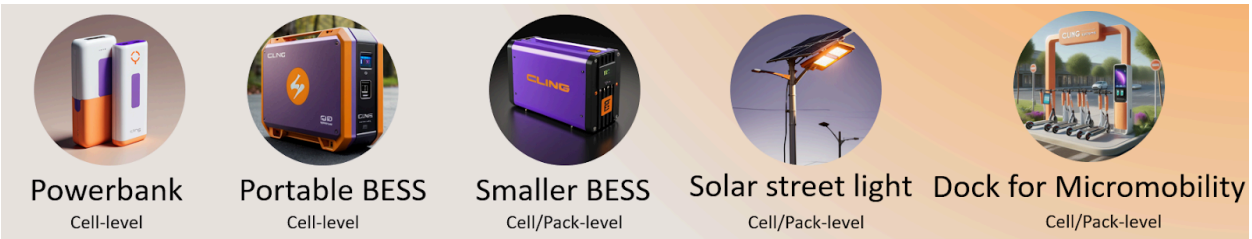
The problem child of the second life market has earned its name from batteries catching on fire and that the scooters are in many cases uncared for, ending up in ditches and rivers. Since the scooters throughout its lifetime have multiple users, the challenge of solving the issue of mistreatment further increases. Other than this challenge, the research found more challenges with the battery, contributing to its name 'The Problem Child'.

The cells inside the scooter batteries are in many cases glued and welded, mainly due to prevent theft as well as counteract vibration. This makes it extremely difficult to dismantle and extract the good cells inside. The time consuming dismantling required in relation to the extracted capacity, just makes the business case of repurposing them economically infeasible. This results in repurposers opting for bigger EV batteries. Not only does the glue and welding aggravate repurposing initiatives, it has also proven to make the recycling hard. In fact, the output from recycling these batteries has shown to be so bad that it can't go back to battery production and instead has to go to the steel industry.

It is obvious that the design of these batteries must be more circular before a repurposing business case out of them is possible. This might explain why the interviewed scooter fleets currently send them to either refurbishment or recycling. Interestingly, none of these scooter fleet companies had current or future strategies for repurposing their batteries. A light in this tunnel is article 11 in the new EU Battery Regulation entering into force by 2027. Article 11 concerns batteries from light means of transport, which includes scooters, and states: *"…those batteries, as well as individual battery cells included in the battery*

pack, are readily removable and replaceable…”. What this actually means, no one knows but through the EU Battery Regulation, the design for scooter batteries *may* look completely different in a few years time, possibly without glue or welding between cells, making them worth monitoring for repurposers and actors on the second life market.

With potentially more feasible dismantling processes, scooter batteries could present a viable business opportunity. When repurposing vehicle batteries, repurposers must decide whether to build their system based on the entire pack or break it down into modules or cells. There are various reasons and benefits for each approach, even for scooter batteries. Here, we present five potential applications at both the cell and pack levels, which should be viewed as early concepts that could be worth examining more thoroughly.



Some criteria are worth considering when building on scooter batteries. The most important one to have in mind is safety. Due to the bad reputation mentioned with batteries catching fire, applications on pack-level should ideally not be close to customers. With cell-level however, the configuration is completely free to design, which can mitigate the safety concern and is therefore not seen as big of an issue. Moreover, applications with significant value beyond its physical one could be suitable since it could pay back the high cost of dismantling them.

Among the proposed applications, solar street lights are considered the most suitable option. Firstly, these are placed outside and not in direct contact with people, lowering the safety concern, which is why you could argue for building on both pack- and cell level. Secondly, they provide a high value beyond its physical one, particularly for municipalities and cities. These customers prioritise public safety and community well-being over cost. As street lights can enhance safety and encourage nighttime activities, contributing to a thriving community, a higher value than its physical one could therefore be argued for.

It is safe to say that the root of the problem with scooter batteries being considered "The Problem Child" lies in lack of sufficient knowledge about them. Speaking with people in the industry, many had not even heard of the possibilities to build on scooter batteries. Scooter fleets themselves had not even considered using their batteries in a second life. Cling Systems, as market enablers for second-life batteries, carries the opportunity to educate the industry about scooter batteries potential, especially going forward. With the expected increase in volume of these batteries and the coming circular design, the “Problem Child” could mature into a respected participant in the second-life market.