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This paper aims to forecast the availability of used but operational electric vehicle (EV) batteries to integrate them into a circular economy concept of EVs" end-of-life (EOL) phase. Since EVs currently on the roads will become obsolete after 2030, this study focuses on the 2030-2040 period and links future renewable electricity production with the potential for storing it into used EVs" batteries. Even though battery capacity decreases by 80% or less, these batteries will remain operational and can still be seen as a valuable solution for storing peaks of renewable energy production beyond EV EOL.

Storing renewable electricity is gaining as much attention as increasing its production and share. However, storing it in new batteries can be expensive as well as material and energy-intensive; therefore, existing capacities should be considered. The use of battery electric vehicles (BEVs) is among the most exciting concepts on how to achieve it. Since reduced battery capacity decreases car manufacturers" interest in battery reuse and recycling is environmentally hazardous, these batteries should be integrated into the future electricity storage system. Extending the life cycle of batteries from EVs beyond the EV"s life cycle is identified as a potential solution for both BEVEOL and electricity storage.

Results revealed a rise of photovoltaic (PV) solar power plants and an increasing number of EVs EOL that will have to be considered. It was forecasted that 6.27-7.22% of electricity from PV systems in scenario A (if EV lifetime is predicted to be 20 years) and 18.82-21.68% of electricity from PV systems in scenario B (if EV lifetime is predicted to be 20 years) could be stored in batteries. Storing electricity in EV batteries beyond EV EOL would significantly decrease the need for raw materials, increase energy system and EV sustainability performance simultaneously and enable leaner and more efficient electricity production and distribution network.

Storing electricity in used batteries would significantly decrease the need for primary materials as well as optimizing lean and efficient electricity production network.

Obrecht, M., Singh, R. and Zorman, T. (2022), "Conceptualizing a new circular economy feature - storing

renewable electricity in batteries beyond EV end-of-life: the case of Slovenia", International Journal of Productivity and Performance Management, Vol. 71 No. 3, pp. 896-911. https://doi /10.1108/IJPPM-01-2021-0029

At the end of 2019, there were 4.79 million battery EVs in the world (Statista, 2020a), and their number is expected to rise above 250 million by 2030 (IEA, 2019). The average lifetime for a vehicle is assumed to be 150,000 km (without battery replacement). This is a typical glider that corresponds to ten years of life expectancy, which reasonably represents an actual European passenger vehicle (Samper-Naranjo, 2021; Dun et al., 2015). Since battery life is dependent primarily on charging cycles, it can be seen that EV batteries will still be operational after the EOL of EV. Therefore, there is enormous potential to seek energy storage possibilities beyond EV end-of-live.

Due to composite materials and battery structure, batteries are incredibly complex and expensive to recycle (especially lithium extraction) (Ho?evar, 2017). Remanufacture is also problematic, and due to hazardous materials and metal compounds, they are inappropriate for energy recovery. Therefore, relating used but operational batteries from used EV after the end of their life cycle is a viable solution that enhances circular economy strategy R3 - reuse (increasing lifespan of products or their parts) (Kirchherr et al., 2017).