

SWAPPABLE BATTERIES MOTORCYCLE CONSORTIUM

A common standard to boost electric mobility



The Swappable Batteries Motorcycle Consortium (SBMC) turns the global challenge of urban mobility and its green transition into a unique opportunity. As the reference organisation in that area, the SBMC accelerates the deployment of Swappable Batteries to L-Vehicles and beyond: we provide a global ground for industrial players along the L-Vehicle electrification value chain to harmonize the framework of this deployment and pave the way to an environmentally and economically sustainable and user-friendly urban mobility.

1. Introduction

While all forecasts confirm that the share of people living in urban areas is constantly growing¹, institutions are stepping up to tackle the challenge of improving air quality and decarbonize cities. In this context, the European Commission launched the European Green Deal² with ambitious objectives for the transportation sector. Transport-related emissions represent nearly 25% of the European Union's total greenhouse gas emissions³. The European Union is currently targeting a reduction of net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels; and a drop of 90% to be reached by 2050⁴.

A widely accepted solution to achieve this target is the electrification of vehicles. Although it entails key challenges, and especially for heavy vehicles, it can also represent an unprecedented opportunity for manufacturers of light mobility vehicles and world-wide users of such vehicles.

With this perspective, the motorcycle industry is bringing together all key stakeholders to develop a common technology to boost electric mobility worldwide. Working together on common standards for swappable battery systems, vehicle and batteries manufacturers, energy and infrastructure providers, research institutes and associations, as well as supporting organizations sharing the same ambition will address the main needs of customers and offer a user-friendly solution for urban mobility.

¹ According to the OECD By 2100, some 85% of the population will live in cities, with urban population increasing from less than 1 billion in 1950 to 9 billion by 2100 (<https://www.oecd.org/regional/regional-policy/The-Metropolitan-Century-Policy-Highlights%20.pdf>). According to the European Commission, Europe's level of urbanisation is expected to increase to approximately 83.7% in 2050 (https://knowledge4policy.ec.europa.eu/foresight/topic/continuing-urbanisation/developments-and-forecasts-on-continuing-urbanisation_en)

² https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³ https://ec.europa.eu/clima/eu-action/european-green-deal/2030-climate-target-plan_en

⁴ https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2050-long-term-strategy_en

This technology will drastically shorten charging time, delete range anxiety, and reduce costs for the final users. Moreover, standardization will facilitate the interoperability, re-using, re-purposing and recycling of batteries for a second life, fulfilling the necessity of a circular economy approach that can sustain any swappable battery business models.

However, this potential technology will only perform at its best if a common ground is found, and only to the extent an agreement is reached on international standards to be adopted globally. For this reason, the main players of the industry have founded the *Swappable Batteries Motorcycle Consortium (SBMC)*: it is to gather all the know-how, expertise and best practices necessary to define and promote common technical specifications and components meant to define the best and fastest way to achieve a workable electrification of L-category vehicles.

2. Swappable Batteries Motorcycle Consortium (SBMC)

In the first phase the Consortium is working on the definition of common technical specifications of the battery system. The activity is not limited to a theoretical definition but will address a test phase and the development of prototypes of batteries and charging stations. This exercise will therefore include field tests carried out with the involvement of battery manufacturers, energy providers and local authorities (i.e., cities and urban governments). The aim of that effort is to verify the efficiency of the specifications and the performance of prototypes, especially from a user perspective.

While the common technical specifications and the prototypes will be finalized, the Consortium will promote them within European and International standardization bodies. The final goal is indeed to adopt a *de facto* standard that can be diffused worldwide. The SBMC is adopting a collaborative approach toward government entities and society, ensuring a dialogue between all parties involved to establish the best possible electrification pathway.

The scope of the work is at this stage limited to vehicles belonging to the L-Category (i.e. mopeds, motorcycles, tricycles and quadricycles as defined by the EU Reg. 168/2013⁵).

3. Advantages of Swappable Batteries

In layman terms, swappable batteries constitute a key opportunity for the electrification of transport. The contribution of this new technology and associated business models can be summarized as follows:

a. For the customer

A standardized swappable battery system will ensure a concrete answer to customers' main doubts regarding electric mobility.

The possibility to “*swap*” a discharge battery from the vehicle with a charged one from the wall station will not require to wait for a few hours anymore, but only a few minutes. Moreover, with a widespread charging infrastructure and the possibility to exchange the

⁵ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32013R0168>

battery in several locations (i.e., gasoline stations, shopping malls and other public places), the customers will not risk being left without charge anymore. The battery will not be recharged only at the end of the trip but can be easily exchanged on the way. In addition, economies of scale will reduce the cost of the battery and will help keeping E-Mobility affordable for everyone.

b. For the environment

This technology will boost the widespread use of light electric vehicles, especially in an urban context. This shall help reduce emissions in line with the international decarbonization agenda and the priorities set by the COOP21 and most governments across the globe. The use of light electric vehicles may also have positive impacts on traffic and congestion in urban areas. Moreover, a standard will enhance the circular economy of batteries, facilitating both their re-use (i.e., for a second life application) and their recycling, supporting the setting up of a sustainable value chain. By sharing the battery overhead in swapping stations by different user groups, an improved utilization of batteries is expected. The contribution pathways to environmental gains are therefore strategic and will boost the necessary green transition of our economy.

c. For the industry

Innovation always leads to an increase in competitiveness in the sector. With the emergence of a new product and a set of new business models, innovation will spur across the sector and beyond; it will also mobilize the capabilities of knowledge providers and innovative SMEs which are instrumental in the value chain as they provide new solutions to the sector and offer a great deal of promises ranging from the attraction of new capital to the diffusion of user-friendly products at a competitive price.

Swappable batteries offer a valid solution for customers that will thus increase the attractiveness of light mobility vehicles. Moreover, the Consortium aims to involve strategic players from several sectors and coming from different regions of the world, paving the way for the emergence of new value chains in a collaborative fashion. This international and diversified partnership will result in the effort to combine the know-how and expertise of all the stakeholders to find out the most efficient solution for customers while generating sustainable business cases for the industry.

d. For cities

Cities are the place where decarbonization strategies for energy, transport, buildings and even industry coexist and intersect. Reaching 100 climate-neutral cities by 2030 is the objective set by the European Commission in its Mission Board for climate-neutral and smart cities⁶. With an exponential growth of electric vehicles on the market, the availability of charging points in cities will become a crucial issue to be addressed by national and local authorities. Consistent recharging time needed for cars implies a longer occupation of EV charging columns. Moreover, the space occupied by a car requires wide areas for parking while recharging. The possibility for light electric vehicles to simply “swap” the battery and move forward will not overload the charging

⁶ <https://op.europa.eu/en/publication-detail/-/publication/bc7e46c2-fed6-11ea-b44f-01aa75ed71a1/language-en/format-PDF/source-160480388>

infrastructure for cars. Furthermore, swapping stations will store batteries in height and will occupy only a minor area on the ground. The benefits of swapping are therefore to be considered in the light of its impact on mobility, space and infrastructure simultaneously. Cities are the closest institutions to citizens. With their proximity they can play a big role in the diffusion of the swapping infrastructure and represent the best interlocutors to the industry. The diffusion of electric technologies will also boost the implementation of smart cities.

4. Battery-System Specifications

Light vehicles are especially suitable for compact and low voltage batteries. Nowadays, most scooters and motorcycles used for daily commuting are within the so-called 50 cc and 125 cc category, and they have a performance ranging to a maximum of 11 kW.

The SBMC will emphasize a reference battery which will bear an energy mark up to 2 kWh, enabling a relative low weight per battery pack – below 12 kg and relative handling dimensions. With a 48 Volt solution, these batteries are easy to handle and are classified as low-voltage equipment (voltage class A limits) in the terms of European regulation. Consequently, this makes it safe and user-friendly for riders to swap, store and recharge.

Depending on the vehicle performance requirements, these new batteries can be used as a single pack or two units in series, and up to eight units in parallel configuration. This allows for a tailored performance, including for other vehicles belonging to the L-Category such as tricycles and small four-wheelers (i.e. L5, L6 and L7 vehicles).

Since the scope of SBMC is to ensure that batteries can be exchanged between different brands and types, the swapping station will be one of the key focus points of the initiative. Therefore, the external geometry and the vehicle interface will have to correspond to the swapping station interface. This means that for standardization the relevant aspects of all elements of the Battery-System are considered, such as the mechanical interface and connectors as well as the communication protocol between the vehicle, the battery, and the charging station.

To make it safe and convenient for users, electrical, mechanical and safety requirements are addressed too and will be in line with European and International Regulations.

A major turn is being taken by the L-Vehicle industry toward electrification. With battery swapping, innovation meets social and environmental benefits. The industry is now providing the necessary effort to harmonize its deployment in the benefits of citizens and the SBMC will be the vehicle of such ambition.

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