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SUSTAINABILITY, CIRCULARITY, AND COLLABORATION: RECHARGING THE EUROPEAN BATTERY INDUSTRY

An electrochemistry expert and a seasoned entrepreneur, Gilles has a solid background in stationary energy storage. Well versed in building start-ups, he was Co-Founder and Battery Lead at Lancey Energy Storage. During his time as Project Manager at the French Alternative Energies and Atomic Energy Commission (CEA), Gilles worked on various French and European lithium-ion battery projects. He is also an expert in fuel cells thanks to his experience at 3M and Renault.

The backdrop of climate issues relating to the transport industry, and the surge in electric-vehicle (EV) sales in response to them, has put the development of eco-friendly batteries center-stage as a key catalyst for energy transition, re-shoring industry, and enabling a low-carbon economy.

But how can the battery lifecycle – from extraction, to production, to end-of-life management – be made truly sustainable? How can the raw material sourcing strategies focus on a green differentiation? How can the battery-manufacturing carbon footprint be minimized? And how can battery recycling be streamlined and rendered more efficient? Finally, what new business and operating models can emerge in this space? These are the key questions, which – if properly addressed – will ensure the industry's social and environmental viability in the long term. These areas are also fundamental requirements of the new European regulatory framework, making them an unavoidable part of organizational strategies. Together with the optimal management of shared resources, they are vital to the energy transition, and therefore to a company such as Verkor.

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Below, we highlight five key recommendations in this space and illustrate the role new technologies can play:

Focusing on provenance of raw materials

Lithium-ion batteries contain materials often described as "critical." These include lithium and cobalt. It is important to note that, although they are finite resources, lithium and cobalt (unlike fossil fuels, which evaporate to leave CO_2) can be reused. This means that, with careful management, the flow of these resources can be relatively secure. However, the sourcing and extraction of these raw materials also raises questions around environmental, social, and governance (ESG) aspects.

It is for these reasons that constructors and regulators are increasing pressure on battery manufacturers to authenticate the provenance of their raw materials and provide assurance that the extraction of these materials neither pollutes the local environment, nor involves unethical labor practices.

A manufacturer who wants to guarantee traceability and high ethical standards can either procure its raw materials directly, or work with an active-materials supplier who can guarantee the origin of the material. This is where partnerships within the value chain play such a vital role. Technologies such as blockchain can help to address traceability challenges. Track-and-trace functionality solutions implemented with blockchain enable entire supply-chain networks to document updates to a single shared ledger, which provides total data visibility and a single source of truth. Volvo is a case in point. The Swedish automotive manufacturer works with its EV-battery suppliers to create a digital ledger that tracks the source of critical materials, such as cobalt.[1]

1 Volvo Cars, "Volvo Cars to implement blockchain traceability of cobalt used in electric car batteries," November 2019.

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Manufacturers who procure their supplies with a long-term perspective are generally rewarded with greater sustainability, which has knock-on benefits in terms of competitiveness and improved quality and, consequently, reputation. The provenance of raw materials is one of the pillars of the strategy adopted by French battery manufacturing startup, Verkor. The organization is focused on building key strategic partnerships across the entire value chain, so that it has oversight of every step of the way.

Reducing the production carbon footprint

Time and again, the question is raised of the size of the carbon footprint produced by the battery-manufacturing process. EVs have a considerably larger carbon footprint in manufacturing than internal-combustion engine (ICE) vehicles, owing to the demands of the battery-production process (for instance, a standard 10 tons of CO_2 for EV car versus only five tons for an ICE car). However, over its lifecycle, the EV footprint is smaller (for instance, in Europe, 10 tons of CO_2 is produced in powering an EV for 150,000 km, and even lower at two tons in a country such as France, which has a decarbonized energy mix — versus 25 tons for an ICE car).

In the same way that low-carbon energy reduces the battery's carbon footprint, production can be optimized by using certain manufacturing procedures and processes:

- **Smart manufacturing:** Verkor's strategy is to use digital and smart manufacturing to create a new generation of "gigafactories" (huge, multi-component manufacturing bases capable of end-to-end production), and guarantee a more efficient, productive, and environmentally sound process. To this end, the organization has joined forces with a number of strategic partners to refine the manufacturing process, minimize waste, and improve its environmental and economic performance.

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- **Low-carbon power supply:** Power supply also has a very important impact. For instance, France's low-carbon energy mix – 67.1% from nuclear power and 24.1% from renewables – ensures a lower carbon footprint in battery production.

- **Proximity to market:** Keeping production close to the consumer market also lowers emissions, limits imports, and drives local job creation.

Giving batteries a second life

ONLY 36%

of automotive original equipment manufacturers (OEMs) partner with suppliers and utilities in promoting a second life for EV batteries.

The volume of end-of-life lithium-ion batteries is set to increase significantly over the next few years, as the EV market and, as a consequence, the manufacturing of batteries escalates. The manufacturer's responsibility should not end when the product goes from production line to client. However, a recent study from Capgemini reveals that only 36% of automotive original equipment manufacturers (OEMs) partner with suppliers and utilities in promoting a second life for EV batteries.[2]

The European battery industry can benefit greatly by collectively developing business models for second-life batteries. Initiatives should include:

2 Capgemini Research Institute, "The automotive industry in the era of sustainability," March 2020.

- Securing partnerships with local stakeholders that deal with the batteries' end-of-life (such as collectors and recycling companies).

- Cracking the logistics conundrum to centralize the collection and testing of used batteries and reducing transportation and storage costs to a minimum.

- Pushing the development of energy-management systems that can combine first- and second-life batteries, using different brands, chemistries, and designs; in this regard, the use of artificial intelligence (AI) will play an important role.

- Staying in close contact with battery manufacturers to understand their technological roadmap and anticipate disruptive innovation.

Future sustainable business models must trace the entire lifespan of a battery cell — from extraction from the vehicle; its second life in stationary storage; recycling; and then return to the factory floor — thereby closing the loop to initiate a circular economy. A strong circular economy backbone will increase the lifespan of batteries; for instance, EV batteries can be given a second life as storage-grid batteries, making renewable energy more economical. Renault Group has already launched several experiments in this area – and is testing stationary battery-storage systems in several European cities.[3]

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3 Renault Group, "The circular economy of the electric vehicle battery," May 2020.

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Closing the materials loop

As soon as the first and second life are over, it is important to recover critical material. There are already regulations in place to encourage the use of recycled materials and, from 2030, the minimum proportion of recycled content will be raised (from 12% to 20% for cobalt; 4% to 10% for lithium; and, from 2035, 4% to 12% for nickel). This trend will lead to new forms of recycling, as well as new concepts in material reuse. In the shorter term, reuse of manufacturing scrap — another hot topic in the battery industry — can increase recycling capacity before batteries reach their end of life.

Collaborating for a more open and sustainable business model

The technology for recycling batteries already exists and, today, it is possible to salvage over 70% of a battery and over 90% of critical materials.[4] Although still in its infancy, the recycling industry is making great strides in lithium-ion battery recycling and will continue to do so in the years and decades to come — starting with the recycling of scrap for new batteries to achieve a circular economy.

4 LeParisien, "Electric vehicles: 700,000 tonnes of batteries to be recycled in 2035," August 12, 2019.

The shift to EVs is part and parcel of the energy transition, and manufacturers will need to play their role sustainably. Developing this industry in Europe opens up new opportunities and will spark new and more open synergies. Verkor's strategy is to form robust and efficient local partnerships, both upstream and downstream, in order to build in more efficient product management and stronger ethics across the value chain. The objective is to create a product with the smallest possible ecological footprint and the greatest possible positive impact on society.

To make their marks on this competitive market, organizations need to look for ways to optimize technological innovation, while fully realizing the potential of their human capital and strategic partnerships. Verkor has achieved this by entering into a number of strategic agreements with key partners positioned across the value chain – from key innovators to industrial production experts.[5]

The development of the EV is a fantastic opportunity to introduce more open and sustainable business models. European regulations are pushing in this direction and embedding the development of Verkor in a sustainable model will give the company an indisputable point of difference. At a time when the challenges of climate change are beginning to impact on our daily lives, addressing the imperatives for traceability, recycling, reducing carbon content, and developing open business models, is by far the best way to ensure the long-term sustainability of Verkor, other players in the battery industry, and the EV market in general.

5 Verkor, "Verkor brings five new partners on board, raising €100m to develop high-performance sustainable battery cells in France," July 2021.

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