Industrial investment for battery cell manufacturing in Europe

Key enablers for the strategic development of the battery industry in the European Union

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RECHARGE

ADVANCED RECHARGEABLE & LITHIUM BATTERIES ASSOCIATION

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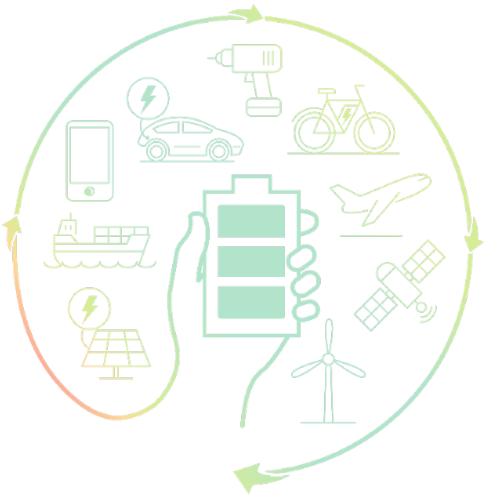
Introduction



Advanced rechargeable batteries are a key enabler for the transition towards low-emission mobility and decarbonised energy generation. Without them, the target of a climate-neutral economy by 2050 and the 2°C Paris Agreement goal cannot conceivably be reached.

Indeed, batteries' applications in automotive and industrial vehicles as well as for the energy sector are key tools for this transition. In the transport sector, the hybridisation and electrification of vehicles reduce CO_2 emissions, whilst the use of batteries in industrial vehicles supports both decarbonisation and noise reduction. In the energy sector, batteries are necessary to store renewable energy and contribute to the stability of the electrical grid. Moreover, batteries power everyday applications, such as smartphones, tablets, power tools, and robots and have become a significant job engine for millions of people around the world.

The need to build a competitive battery cell manufacturing capacity in Europe

In May 2018, the European Commission adopted a Strategic Action Plan for Batteries that sets out measures to support the establishment of a European battery value chain worth up to an expected €250 billion by 2025, able to compete with current manufacturing bases (mainly in Asia). The Action Plan stresses the need for a coherent regulatory framework which will enable a competitive battery industry based on innovative and sustainable products.

In fact, the European battery industry currently holds a very limited share of the world (lithium) cell manufacturing capacity. A detailed description of the market position of the European battery industry can be found in paragraph 1 of Annex.

Therefore, a clear strategy, supported by a strong and coordinated action plan is needed to ensure the successful growth of a competitive European industry.

RECHARGE supports multiple initiatives aiming at the creation of a favourable environment for this industry development in Europe. These include:

- the review of the EU legal framework applicable to new and used batteries (Batteries Directive, a new "sustainable batteries" legal instrument, Waste Shipment Regulation and REACH, as the key legislations),
- the support in Research and Innovation (through the new ETIP BatteriesEurope, the Batteries2030+ Coordination and Support Action, and as part of an upcoming batteries PPP),
- efforts to ensure a level playing field for the European industry.

But in addition to these initiatives, there is a need to accelerate industrial investments.

In the framework of the European Batteries Alliance, new projects continue to emerge, and the construction of new battery manufacturing plants has well started in Europe (see paragraph 2 of Annex). More projects are expected, following the recent and upcoming announcements of IPCEIs for several integrated projects involving over 10 Member States and over 50 companies.

Several new facilities will focus on cell manufacturing. To be able to compete with a strong, established manufacturing value chain outside of Europe, they will require large-capacity, high-performance, cost-competitive cell manufacturing equipment to be installed.

The development of a European "ecosystem" supporting the European battery industry, including the supply of manufacturing equipment, is certainly part of the Strategic Action Plan. The equipment segment has to organically grow, in conjunction with the development of next generation lithium batteries (LIB) towards solid state battery technology and the massive investment in new equipment that is required to do so.

Based on existing lithium cell manufacturing standards, the most advanced manufacturers are currently located in Asia, and many of the most competitive ones are in China. Over the next few years, EU access to next generation equipment is an important enabler to kickstart a thriving manufacturing base in Europe.

In this regard, customs tariffs of 1.7% applicable to the "HS Code 8479899750 - Machinery, being components of a production line for the manufacture of lithium ion batteries for passenger electric motor vehicles, for the construction of such a production line", and other lithium-based batteries are reducing the competitiveness of the European battery industry.

Recommendation

To facilitate the establishment of a competitive lithium cells manufacturing capacity in Europe, the advanced rechargeable and lithium batteries industry in Europe, as represented by RECHARGE, recommends that the suspension of custom taxes on imported manufacturing equipment, which was withdrawn in July 2019, be reinstated for a period of time which should not exceed four to five years, the equivalent to the necessary lead time for EU machinery manufacturers to develop a competitive lithium cells and batteries manufacturing equipment offering.

ANNEX

1. Status of lithium batteries manufacturing and market

1.1 Market size

The battery market has enjoyed a strong development in the past years, particularly thanks to new applications enabled by technological advancements in LIB technology. The worldwide battery market reached a value of €86 billion in 2018, with €73 billion in rechargeable batteries alone.

LIBs made up for more than €32 billion in 2018, representing a capacity of over 150 GWh. The added value breakdown along the value chain is presented in figure 1.

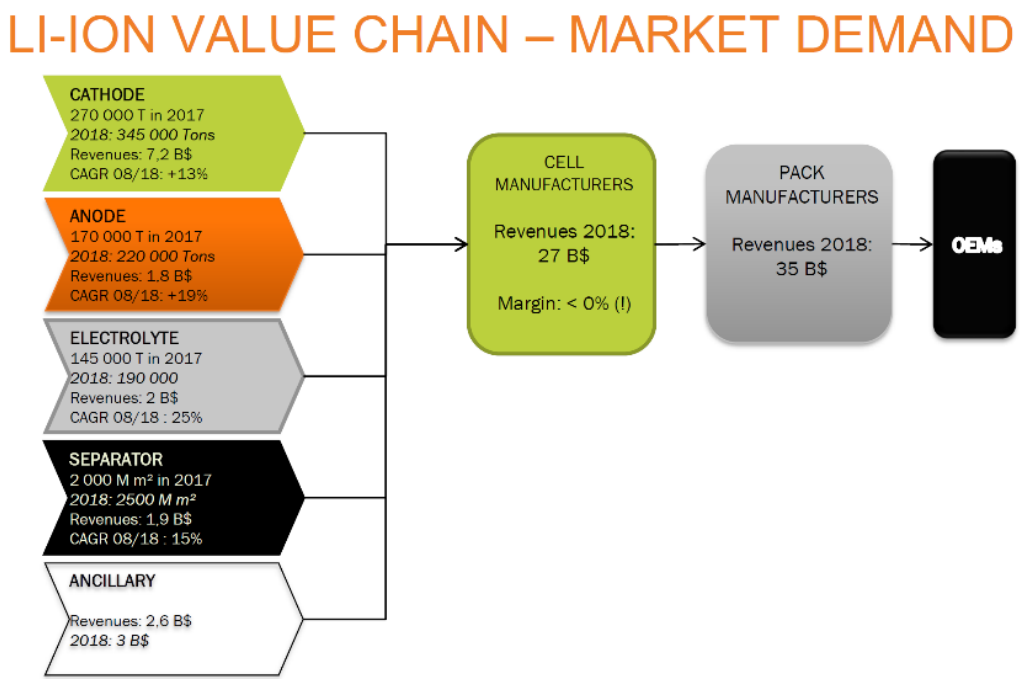


Figure 1. Lithium-ion batteries value chain (worldwide), C. Pillot, Nice batteries conference, Oct 23, 2019. Avicenne Energy 2019

The corresponding batteries markets have been reviewed recently in the JRC report "Li-ion batteries for mobility and stationary storage applications, Scenarios for cost and market growth" (*ref 1*): Since their market penetration in the 1990s, LIBs have been used in applications such as electronics, medical devices and power tools. By 2010, their total market volume had increased by one order of magnitude (from about 2 to 20 GWh), reaching a total annual market value of about €6.5 billion, largely linked to portable electronics. Since 2010, LIBs have been growing annually at a rate of 26 % in capacity and 20 % in value. In 2017, the total market size of LIBs was approximately 120 GWh or €24 billion.

1.2 Risks of an unbalanced global market structure

Currently, a very limited share of this market is supplied by the EU industry. EU manufacturing of industrial lithium cells is critically low when compared to other regions (mainly Asia). Figure 2 represents the market share of key countries for lithium cells manufacturing

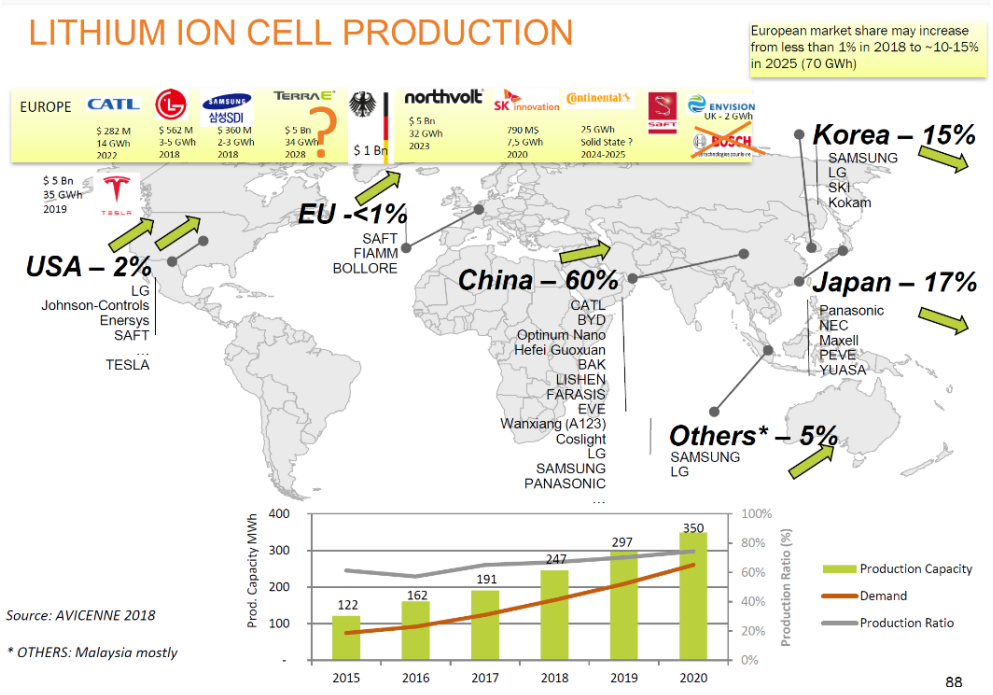


Figure 2. Lithium batteries cell production in the world, C. Pillot, Nice batteries conference, Oct 23, 2019. Avicenne Energy 2018

In addition to limited economic benefits, the dependence of the EU on Asian countries raises strategic stability concerns.

This situation is particularly critical when it comes to the development of an electric vehicles (EVs) infrastructure in Europe. In fact, the large majority of electric vehicles manufactured in Europe depends on the import of cells manufactured in Asia. The status of this value chain has been analyzed in a JRC report (Lithium ion battery value chain and related opportunities for Europe, *ref 2).*

Figure 3 illustrates the value chain for automotive LIBs. The value chain is divided into six segments spanning the spectrum from raw material mining to battery recycling. Mining and chemical industries provide the myriad of raw and processed materials used in the production of the various cell components, including the anode, cathode, electrolyte and separator. These components are then assembled in individual cells. Some materials are produced and used exclusively in lithium ion cell production while others can be used for other purposes. While the majority of the produced lithium ion cells is assembled for use in portable electronic devices, a fast-growing share is destined for use in battery packs for electric vehicles. When batteries reach the end of their life in their first application,

they can be recycled or alternatively employed in a second use application (e.g. for stationary energy storage) then.

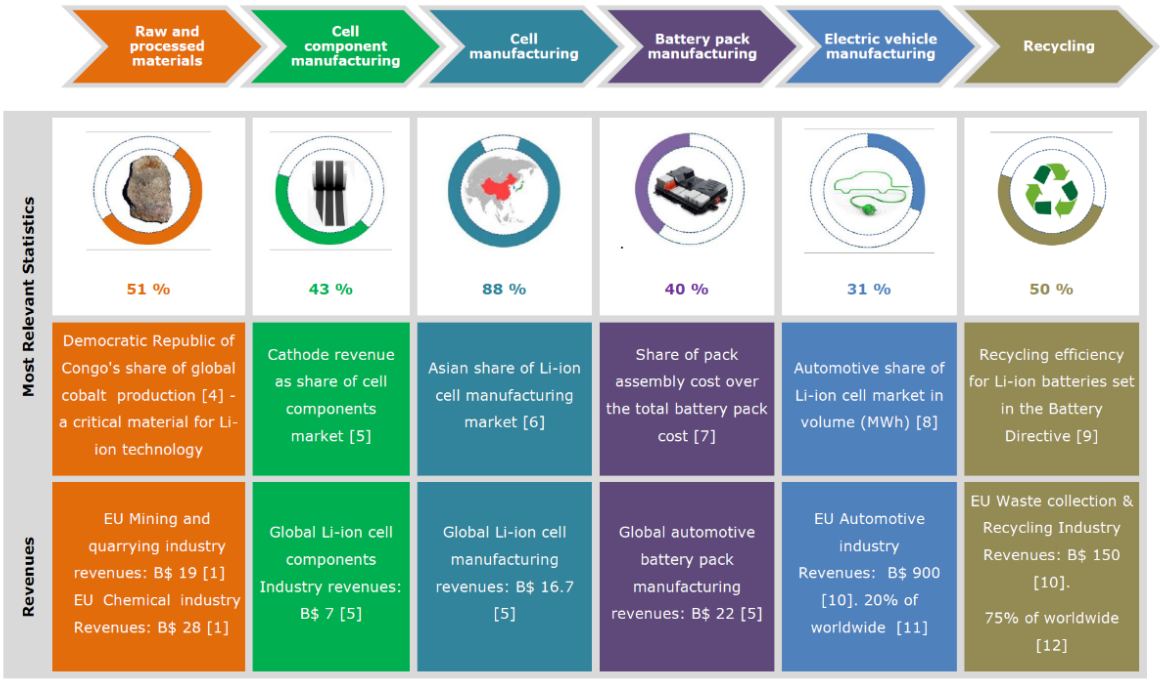


Figure 3: Automotive lithium-ion battery value chain (data from 2015).

1.3 The potential development of the battery industry in Europe

At European level, particularly for the EV sector, the expected future development is large, as presented in the last JRC report (*ref 1*):

Large-scale deployment of electric vehicles will lead to a further decrease in LIB costs in the coming years:

- Cost levels between 75 and 100 €/kWh can be reached by 2025 – 2030, indicating the feasibility of the cost targets set by the SET Plan. At these cost levels, massive deployment of electric vehicles can be expected globally. By 2030, the number of electric vehicles on the road will be 10 to 50 times higher than today. In Europe alone, 12 to 19 % of the passenger car fleet is expected to be electric.
- These expected developments offer relevant signals to the EU industry, energy system providers (e.g. infrastructure) and other stakeholders (e.g. market design) to anticipate the disruption. Investment costs of LIB stationary storage systems will decrease, yet improvements should also focus on non-battery pack system components.
- LIB stationary storage system costs will decrease significantly following the development of batteries for electric vehicles due to spill-over effects.
- By 2040, stationary storage system costs are expected to range between 165 and 410 €/kWh, depending on system configuration.
- High costs in system storage come with components such as power electronics, energy management system, balance of plant, system integration and soft costs.

- Intensified R&D and increase in manufacturing capacity, for example, could generate a significant cost reduction for the mentioned system components. European manufacturing of lithium ion battery cells will increase its share in global production, provided that all announced plans materialise. Supplying domestic demand may prove challenging if capacity does not ramp up after 2025.
- In the coming years, the global share of European lithium ion battery cell manufacturing capacity is expected to increase from about 3 % today to 7 – 25 %. Slightly more than half of this capacity will be deployed by well-established Asian lithium ion battery cell producers.
- By 2025, the global market for LIBs for electric vehicles could reach €40 - 55 billion p.a. For European production this could entail a growth from about €450 million p.a. (2017) to €3 – 14 billion p.a. (2025).
- Albeit relying on imports today, Europe has the potential to cover almost all its annual demand for lithium ion battery cells by 2025. Thereafter, due to rapid increase of electric vehicle sales, domestic capacity would need a further significant boost to remain self-sufficient.
- The global demand for LIBs is foreseen to grow also in the long-term and may exceed €200 billion p.a. by 2040. To ensure the competitiveness of the EU on the global scene, efforts in increasing the European manufacturing base should continue after 2025. Re-using and repurposing of LIBs to energy storage applications after their end-of-life in electric vehicles contribute to further cost reductions.
- In the longer term, the volume of batteries from electric vehicles will be sufficient to supply the needs for stationary storage, if batteries are re-used.
- Second life of batteries could further reduce costs of stationary storage by about 20% or 30 to 45 €/kWh.

2. The development of European cell manufacturing

Several recent reports have assessed the ongoing development in Europe, at a horizon of five to eight years. The future growth, including the European share, is described in a recent JRC report (ref 1):

Global manufacturing capacity of lithium ion cells for EVs and stationary storage is around 150 GWh, with two-thirds of the capacity being located in China. In recent years, production was characterised by low utilisation rates of about 50 % and overcapacity. Based on company announcements, substantial growth is expected in the near future, ranging from additional 240 to 450 GWh. That is, by 2022, global lithium ion cell production capacity will be 2.5 to 4 times higher than today. With both EV sales and the global manufacturing capacity for lithium ion battery cells rapidly increasing, the market situation is expected to come into better balance in the near future. Noticeable is that while the future market share of lithium ion cell manufacturing is expected to continue to be dominated by Asian players, steepest growth rates are expected in Europe, especially due to the limited domestic capacity today. By 2022, the global share of European lithium ion battery cell manufacturing capacity is expected to increase from about 3 % today to 8 % (Figure 4). By 2028, due to additional capacity and plant expansions in Europe, the total lithium ion cell manufacturing capacity may reach about 105 GWh, if all current plans and announcements materialise. In the coming decade, depending on the year that new production lines become operational and near-term market projections, Europe may serve between 7 and 25 % of the global demand.

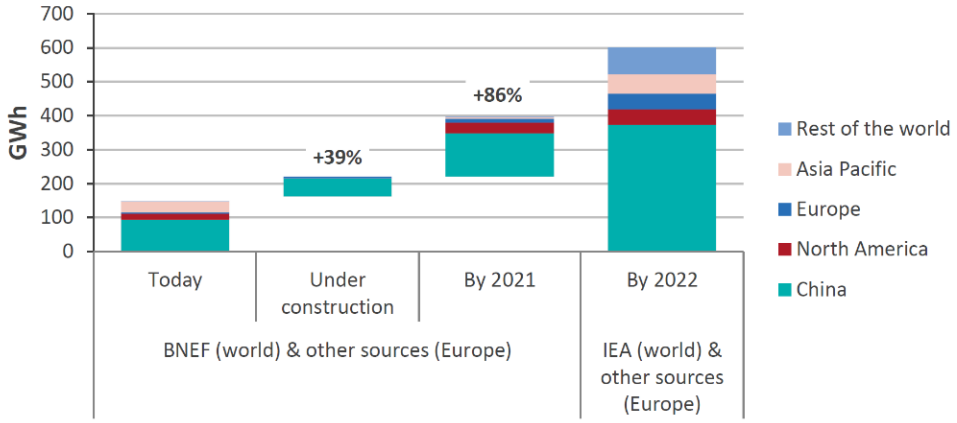


Fig 4 (ref 1) Expected near term growth in global and EU manufacturing capacity. Source: JRC based on BNEF [94] (world) and other sources for Europe [36, 95-97]. IEA data used for 2022 [59]

The JRC (ref. 3) also assessed the impact of the future European battery industry on the job market. It is estimated that on average 140 (ranges between 90 to 180) direct jobs are created per GWh produced per year. This analysis is based on estimates from 7 different battery production facilities (and takes into account high automation rates). With 131 GWh produced annually in 2023 and 274 GWh in 2030, this translates into approximately 18,000 new jobs in battery cell manufacturing in 2023 (between 12,000 and 24,000) and 38,400 in 2028 (between 25,000 and 49,000). On top of these high-quality - and future-proof - jobs from direct manufacturing, a significant number of indirect jobs is also to be created. According to Northvolt, their 32 GWh factory alone would create more than 20,000 indirect jobs. These jobs are expected to be created in the immediate vicinity of the cell producing plant and include suppliers, subcontractors, logistics, mechanical engineering, construction and automation companies.

Similarly, the JRC estimates the multiplication factor between the total number of jobs created along the complete value chain and the direct ones created in cell manufacturing to be in the range of 3.7 to 7.5. At European level, indirect jobs created from battery cell manufacturing would be between 68,000 and 138,000 (central estimate: 103,000) in 2023, and between 142,000 and 288,000 (central estimate: 215,000) in 2028.

At RECHARGE, we estimate that battery cell manufacturing has the potential to create about 120,000 future jobs in the EU by 2023, and 250,000 jobs by 2028.

REFERENCES

(1) Tsiropoulos, I., Tarvydas, D., Lebedeva, N., Li-ion batteries for mobility and stationary storage applications – Scenarios for costs and market growth, EUR 29440 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-97254-6, doi:10.2760/87175, JRC113360

(2) Lebedeva, N., Di Persio, F., Boon-Brett, L., Lithium ion battery value chain and related opportunities for Europe, EUR 28534 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-66948-4, doi:10.2760/6060, JRC105010.

(3) Steen M., Lebedeva N., Di Persio F., Boon-Brett L., EU Competitiveness in Advanced Li-ion Batteries for E-Mobility and Stationary Storage Applications –Opportunities and Actions, European Commission, Petten, 2017, JRC108043

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ADVANCED RECHARGEABLE & LITHIUM BATTERIES ASSOCIATION

Founded in 1998, RECHARGE represents the multifold interests of the advanced rechargeable and lithium battery industry in Europe. Our unique membership covers all aspects of the advanced rechargeable batteries value chain, from suppliers of raw materials and battery manufacturers to OEMs, logistic partners, and battery recyclers. To act on our mission of promoting advanced rechargeable batteries as a core technology that will contribute to the industrial and social revolution towards a more empowered, sustainable, and circular Europe, we put all our efforts in improving battery acceptance while ensuring an international level playing field that provides continued market access for new and existing products.