# Future prospects of energy storage batteries 16 kWh

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This article is a collaborative effort by McKinsey's Battery Accelerator Team in cooperation with the Global Battery Alliance and its members. The authors include Jakob Fleischmann, Mikael Hanicke, Evan Horetsky, Dina Ibrahim, S?ren Jautelat, Martin Linder, Patrick Schaufuss, Lukas Torscht, and Alexandre van de Rijt.

Although battery growth will confer multiple environmental and social benefits, many challenges lie ahead. To avoid shortages, battery manufacturers must secure a steady supply of both raw material and equipment. They must also channel their investment to the right areas and execute large-scale industrialization efficiently. And rather than just greenwashing--making half-hearted efforts to appear environmentally friendly--companies must commit to extensive decarbonization and true sustainability.

Faced with these imperatives, battery manufacturers should play offense, not defense, when it comes to green initiatives. This article describes how the industry can become sustainable, circular, and resilient along the entire value chain through a combination of collaborative actions, standardized processes and regulations, and greater data transparency. By emphasizing sustainability, leading battery players will differentiate themselves from the competition and generate value while simultaneously protecting the environment. The strategies and goals presented here are aligned with both McKinsey"s battery supply chain vision and the GBA"s principles.

Global demand for Li-ion batteries is expected to soar over the next decade, with the number of GWh required increasing from about 700 GWh in 2022 to around 4.7 TWh by 2030 (Exhibit 1). Batteries for mobility applications, such as electric vehicles (EVs), will account for the vast bulk of demand in 2030--about 4,300 GWh; an unsurprising trend seeing that mobility is growing rapidly. This is largely driven by three major drivers:

Battery energy storage systems (BESS) will have a CAGR of 30 percent, and the GWh required to power these applications in 2030 will be comparable to the GWh needed for all applications today.

China could account for 45 percent of total Li-ion demand in 2025 and 40 percent in 2030--most battery-chain segments are already mature in that country. Nevertheless, growth is expected to be highest globally in the EU and the United States, driven by recent regulatory changes, as well as a general trend toward localization of supply chains. In total, at least 120 to 150 new battery factories will need to be built between now and 2030

globally.

In line with the surging demand for Li-ion batteries across industries, we project that revenues along the entire value chain will increase 5-fold, from about $85 billion in 2022 to over $400 billion in 2030 (Exhibit 2). Active materials and cell manufacturing may have the largest revenue pools. Mining is not the only option for sourcing battery materials, since recycling is also an option. Although the recycling segment is expected to be relatively small in 2030, it is projected to grow more than three-fold in the following decade, when more batteries reach their end-of-life.

Companies in the EU and US are among those that have announced plans for new mining, refining, and cell production projects to help meet demand, such as the creation or expansion of battery factories. Many European and US companies are also exploring new business models for the recycling segment. Together, these activities could help localize battery supply chains.

The global battery value chain, like others within industrial manufacturing, faces significant environmental, social, and governance (ESG) challenges (Exhibit 3). Together with GBA members representing the entire battery value chain, McKinsey has identified 21 risks along ESG dimensions:

Here are what some battery industry leaders and experts have to say about sustainability:

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