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Energy Transition

How Li-ion batteries and grid modernization can accelerate energy players' transformation agenda

Energy transition—the process of shifting from a fossil-based energy system to renewable energy sources—is typically viewed through the lens of generation. While it's true that increasing the share of green energy sources within the electricity mix is a critical aspect of reaching long-term energy targets, near and medium-term goals will be met in large part through more efficient management of the existing energy supply.

This year's **World Energy Markets Observatory (WEMO)**, Capgemini's annual thought leadership and research report that tracks the development and transformation of energy markets around the world, explores this issue further, delving into the many facets of energy transition, including infrastructure upgrades, system enhancements and other technologies that can improve efficiency. Here we explore two of the most critical enablers of energy transition: batteries and grid modernization.

Batteries: An essential component of the energy transition strategy

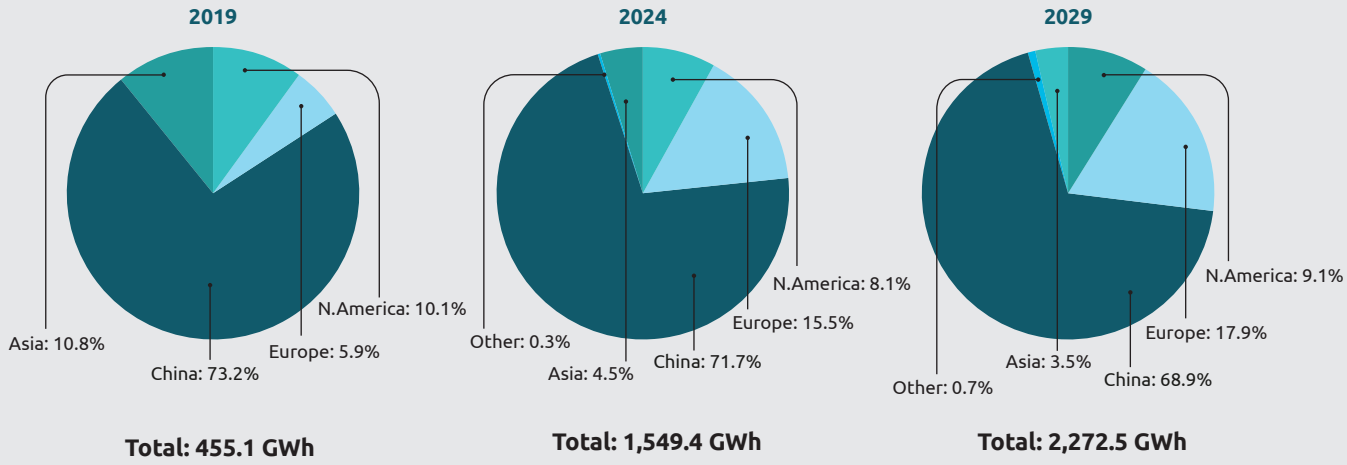
Our research indicates that renewables will account for almost half of the European power generation mix by 2025. In order to manage this increased supply of power from intermittent sources, energy players will need to scale the use of batteries to capture and store energy to maintain grid reliability and security of supply.

The good news is that battery costs have fallen by almost one-fifth (19 percent) over the past decade. In addition, the production of Li-ion batteries, which has mostly been relegated to Asian markets, is now expanding throughout the world. At time of publication, 115 megafactory plants were planned worldwide, leading to 2632 GWh in new capacity by 2028—which is enough to charge 40 million EVs. While China maintains its lead in production with 88 factories planned, our analysis indicates that Europe will triple its market share in the megafactory market from 6 percent in 2019 to 18 percent by 2030[1].

Our research also indicates that the battery supply chain is becoming increasingly localized, as accelerated by supply chain disruptions stemming from COVID. While Europe is far from being self- sufficient in terms of battery production, our research shows that many regional car manufacturers are taking steps to reduce dependency within the value chain, from extraction and processing of raw materials to the preparation of necessary treatment processes for recycling.

FIGURE 1

MEGAFACTORY CAPACITY BY REGION



Source: Benchmark Mineral Intelligence, Lithium-Ion Batter Megafactory Assessment, February 2020

1 Benchmark Mineral Intelligence, Lithium-Ion Batter Megafactory Assessment, Feb. 2020

For example, a growing number of projects to mine lithium in Europe have been initiated. According to the European Commission, four projects of sustainable lithium extraction totaling €2B have been financed. It is estimated that these projects could meet four-fifths of the European demand in the battery sector within the next five years. As a result, the lithium ion battery supply chain will evolve into a local-global hybrid wherein the majority of the supply chain, including cathode production, anode finishing, battery cell and pack manufacturing, EV assembly, and battery recycling happens locally.

Grid modernization: Maintaining security of supply

The growing use of renewable energy sources also raises important and urgent questions about grid stability and security of supply.

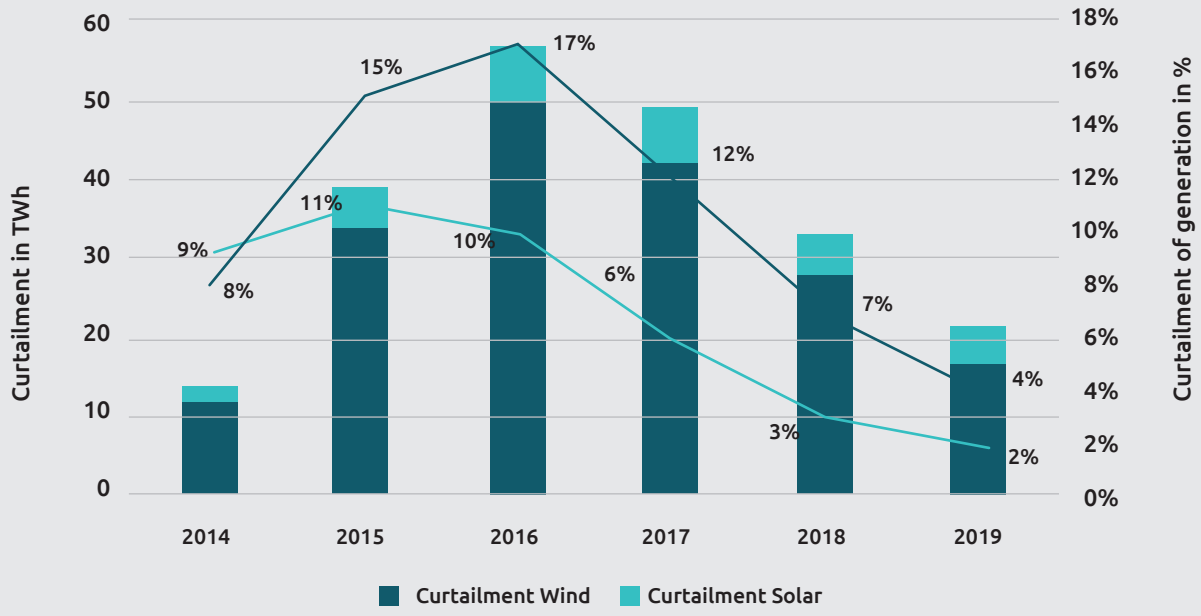
For example, this past spring, National Grid, the U.K.'s transmission operator, urgently requested energy regulators to switch off solar and wind farms. These sources, which were accounting for an unprecedented 40 percent of the electricity mix at the time, were deemed a significant risk to grid stability during an upcoming bank holiday.

Similarly, the state of California, which serves one-third of demand through renewable sources, experienced rolling blackouts this past August as a result of a so-called "perfect storm" of conditions: high temperatures across the region, which prevented other states from contributing electricity to California; diminished output from renewable sources, particularly solar during evening hours; weather-related disruptions at fossil-fueled power plants; and, in some cases, plants going offline.

Similar issues are also common in the developing world. For example, China, occasionally curtails renewable sources in order to improve grid stability. Our analysis shows that while curtailment rates are falling steadily, current levels are still significantly higher in 2019 as compared to 2014. China aims to address this point through an expansion of its "super grid," which would link those regions where renewable energy is generated with areas in need of supply through a series of ultra-high voltage power lines, as well as penalties on producers that fail to balance generation and/or predict volumes.

FIGURE 2

ANNUAL CHINESE WIND AND SOLAR CURTAILMENT



With so many countries and regions facing security of supply issues, this year's WEMO report identifies several ways that energy players can modernize their grid. Our recommendations include:

- Build new transmission lines, reinforce existing ones and implement the smart grid at scale to improve efficiency and reduce risk;
- Maintain schedulable generation to support and sustain load and demand;
- Incentivize the accuracy of intermittent generation predictability with producers;
- Increase storage options, including the use of Li-ion batteries;
- Develop demand-side management and flexibility remuneration, particularly among industrial clients;
- Evolve curtailment rules to support healthy electricity generation; and
- Expand the DSO role to manage local balance through data, analytics and intelligent automation.

To determine which of these solutions will help your organization accelerate and improve its energy transition efforts, please download a copy of the 22nd edition World Energy Markets Observatory and reach out to our authors today.

A perspective from our Capgemini experts:

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