Europe Vies for Battery Hotspot With Goal to Be Greenest: BNEF

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Nestled among pine trees in the northeast corner of Sweden, a 500,000 square-meter factory is fast unfolding under Northern skies. Inside these walls, many thousands of battery cells will be produced from next year ready to serve Europe's accelerating demand for electric vehicles.

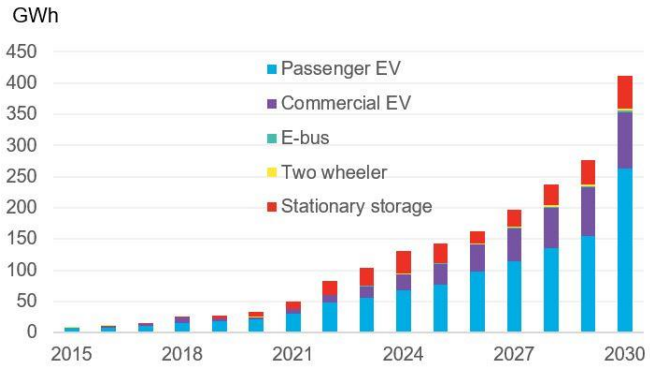
Production at Northvolt AB's Swedish plant will be powered by renewable electricity from nearby wind and hydroelectric plants, and will be 'vertically-integrated', meaning that more stages of production are taken in-house than is typical for the battery industry. For example, the team at Northvolt Ett will prepare the active material used in battery cathodes, having sourced metals from miners with a track record in sustainability. It will have an expected annual output of 40 gigawatt-hours of batteries, once fully built.

"The sustainability differentiator is key not only for us but for Europe to stand out too" in the battery market, Emma Nehrenheim, chief environmental officer at Northvolt, told BloombergNEF. "The European package of performance, safety and sustainability will be very competitive," she said.

Europe's battery market will be worth 250 billion euros ($280 billion) by 2025, forecasts the European Battery Alliance (EBA), as demand for EVs, stationary storage and industrial storage applications ramps up. Asia currently accounts for the vast majority of global battery production, but could cede ground to Europe if the latter can harness its automotive and industrial experience, and relatively green electricity grids, to offer a compelling product.

"European companies now stand a real chance of competing with their Asian peers. They not only have the vision and drive, but also the government and EU support," said James Frith, head of energy storage at BNEF. "Over the last 18 months, European governments have begun to realize the potential economic benefits of securing battery manufacturing, and the green stimulus packages resulting from the Covid-19 pandemic, which support Europe's EV industry, have given a further boost."

Rising battery demand in Europe



European battery demand is forecast to rise to 412GWh by 2030. Data excludes lithium batteries used in consumer electronics, back-up power and telecommunications.

Source: BloombergNEF

Automakers such as Volkswagen, Daimler and Tesla are developing EV production capacity in Europe, and will benefit from nearby battery factories. Europe's automotive and stationary storage battery demand is forecast to be as much as 412 gigawatt-hours by 2030 – a huge increase on the 34GWh of current production, forecasts BNEF.

As the EV industry matures, vehicles containing batteries with a lower emissions footprint could well stand out from the crowd.

The race is on. Northvolt Zwei in Germany represents a joint venture between Northvolt and Volkswagen to

make batteries starting from 2024, while in France, Renault will join the existing alliance between Saft, Total and PSA to produce batteries as part of the French company's bailout package.

Mercedes-Benz AG is investing more than one billion euros in nine battery factories at seven locations across Europe, North America and Asia. Its Accumotive division in Germany boasts CO2-neutral production and will soon make more than half a million battery systems for hybrids, plug-in hybrids and battery-electric vehicles each year.

Its parent, Daimler AG, recently announced investment in China's Farasis Energy Ganzhou Co., which aims to start mass delivery of CO2-neutral batteries next year.

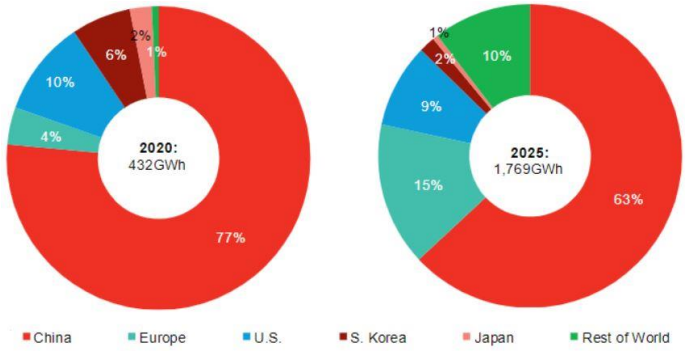
Also in Germany, BMW AG plans to add eight production lines for battery modules and electric motors at its Dingolfing plant in Bavaria, as part of a 500 million-euro investment to produce electric drives from more than half a million cars annually.

"Partnerships are key in order to make big bets and commit to the sustainability transition expected from end-customers," Nehrenheim said. Northvolt has also set a target for 50% of raw material in 2030 to come from recycled batteries, and is partnering with Norsk Hydro in Norway to achieve this. The Hydro Volt joint venture will establish a recycling hub in Norway from 2021, in which Northvolt will make use of the battery materials and Norsk Hydro will recycle the aluminum. Northvolt's investors include Volkswagen, BMW and Goldman Sachs.

Elsewhere in Scandinavia, Freyr plans to build Norway's first large-scale battery facility in Helgeland, which has access to 100% renewable power and cooling water. The company aims to have 34GWh of production online by 2025 (enough to supply 600,000 EVs annually), and will partner with other companies to produce batteries through licensing their technology. "Norway has some of the lowest power tariffs in the world and a skilled labor force from oil and gas that will be applicable to battery cell production," said Chief Executive Tom Einar Jensen.

Freyr has raised 130 million Norwegian kroner ($13.7 million) from investors including Helgeland Invest and the Adolfsen Group to finance the development of its 2GWh fast-track facility, expected to commence construction next year.

Europe to make more lithium-ion cells



Source: BloombergNEF's *Long-Term Electric Vehicle Outlook 2020* (web I terminal)

Asian companies stake claim on European soil

South Korea's Samsung SDI Co., SK Innovation Co. and LG Chem Ltd. are all establishing manufacturing bases in Eastern Europe in response to the continent's rising demand for lithium-ion batteries. China's Contemporary Amperex Technology Co. also plans to launch its first overseas factory in 2022, in Germany.

Samsung SDI was the first to open a plant, in 2018 in Hungary, with initial output of 2.5GWh. It is being joined in that country by SK Innovation, supplier to Daimler, Volkswagen and Hyundai. LG Chem's plant in Poland is expected to operate from 2022, with long-term plans for 70GWh, while CATL's German plant will supply German automakers, plus Sweden's Volvo AB. The close proximity of Asian-owned battery factories will help European automakers improve their supply chain sustainability.

Integrated supply

The more integrated and localized a battery supply chain, the less transportation required and the lower the emissions. Developers of lithium mines in Portugal and Spain are seeking to capitalize on the rollout of European battery production, and there are also

deposits in Germany, Finland, Austria and the Czech Republic, according to the EBA.

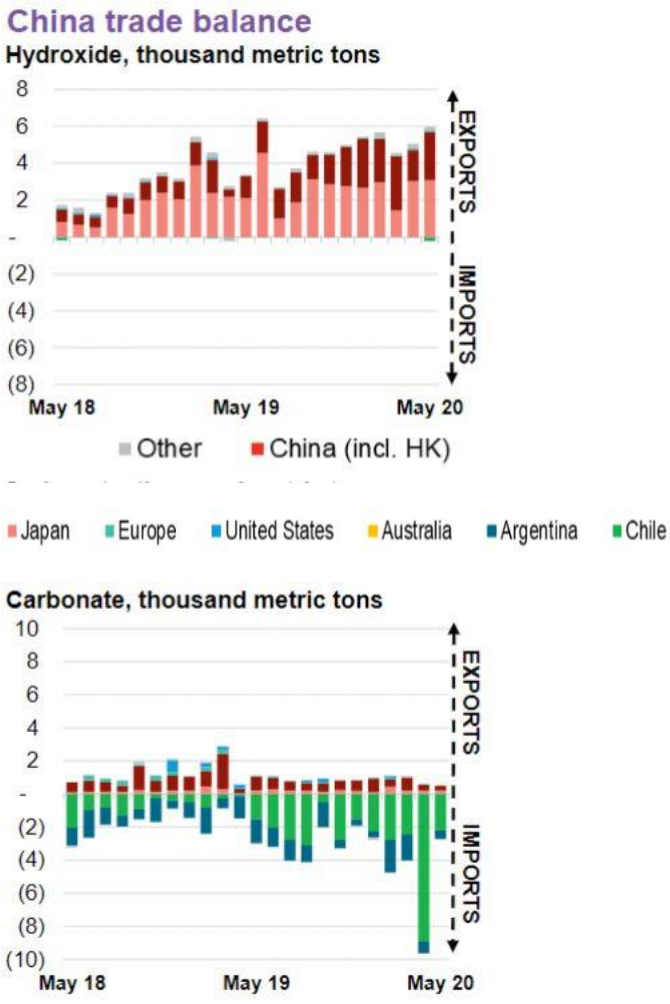
Infinity Lithium aims to produce a minimum of 15,000 metric tons of lithium hydroxide annually from a deposit of mica rock close to Madrid, and is selecting battery and cathode makers to test its samples. Its San José lithium project has received 0.8 million euros in funding from EU-backed EIT InnoEnergy. This will go toward its pilot plant to be built next year. It plans full-scale production from 2023.

The process of extracting lithium from mica rock uses less energy than is required for extracting the metal from the harder spodumene rock found in Australian deposits, said Vincent Ledoux Pedailles, executive director of corporate strategy at Infinity. The company also recycles the potassium sulfate and water used in its process, while almost all of its electricity is renewable, Pedailles told BNEF. "We can produce lithium hydroxide in an end-to-end process to achieve high-purity lithium, and when our pilot proves successful, we will be able to license it out to other mica projects across Europe," he said.

Savannah Resources is developing a lithium mine in nearby Portugal from a spodumene deposit, with estimated annual output of 26,000 metric tons of lithium carbonate – equivalent to about 4% of global lithium production by 2022 when the mine is expected to be online, according to BNEF estimates. A feasibility study and an environmental assessment of the project are currently in progress. However, the lithium carbonate will need to be converted to lithium hydroxide for use in EV batteries with a high nickel content, such as those used by Tesla. This will likely require shipment to a refinery in China.

"The cost to ship cells will become a bigger factor in supplier choice," particularly as the hazardous nature of batteries makes them expensive to transport, said Kevin Brandish, chief executive of Amte Power. The U.K.-based cell maker aims to make specialized, high power cells for performance vehicles from the likes of Bentley and Aston Martin, as well as the off-road vehicle market. The price premium will be three times that of mass-market cells, Brandish told BNEF.

China imports lithium carbonate, exports hydroxide



China's lithium trade balance

Source: BloombergNEF's *Battery Metals Monthly: June 2020* (web I terminal) *using data from China Customs, South Korea Customs*

Amte Power's planned 1-3GWh factory in northeast England or Scotland will benefit from "locally-produced power from renewable sources such as wind and biomass". The company will also seek to source as much material as possible from the U.K.

Amte Power will integrate excess steam from biomass generation into processes that previously would have used electricity for heating, in an effort to improve

sustainability. The company aims to start building the factory in 2023, with 200 million pounds of investment raised from private funds and government support.

Customization

InoBat Auto is developing 'customized' batteries for high-performance EVs and aims to build a 100MWh pilot plant in Slovakia next year, followed by a one billion-euro gigafactory in 2024. The company has secured 10 million euros of investment from Prague-based utility CEZ Group, five million euros from the Slovakian government and a potential loan from the European Investment Bank.

The company will put recyclability and CO2 reduction at the forefront of its cell production, Marian Bocek, co-founder and chief executive at InoBat, told BNEF.

The U.K. Battery Industrialization Center enables battery manufacturers to "gain confidence about the market" before deciding to invest in a facility of their own, said Managing Director Jeff Pratt. The facility will "produce electrode, multi-format cells, module and packs" and is expected to open toward the end of the year, Pratt told BNEF. Sited near Birmingham in central England, it may benefit from being in close proximity to U.K. automakers such as Jaguar Landrover, Bentley and Aston Martin.

Recycling

The New Regulatory Framework for Sustainable Batteries expected from the European Commission later this year will likely create a conducive environment for battery recycling. Expectations are that it will set product standards and transparency requirements on CO2, in addition to collection rates and recycling targets for end-of-life batteries.

Recycling is not only good for sustainability, but for economics too, particularly if a substantial proportion of the valuable nickel, cobalt and lithium gets recovered, said Bo Normark, Industrial Strategy Executive at EIT InnoEnergy. Even if Europe succeeds in developing a lithium supply chain, the industry will still be largely reliant on sourcing nickel and cobalt from outside its borders, he said.

"The main challenge is on collection and sorting for lithium-ion battery recycling", said Northvolt's Nehrenheim. "Our aim is to build strong partnerships for returning batteries at end of life so we don't lose volume," she said.

Digitalization

Digital innovation can also improve factory efficiency and cut emissions in battery production.

Schneider Electric SE is working with Northvolt, Volkswagen, General Motors, Samsung SDI and LG Chem on optimizing electrical infrastructure through the use of digital modelling, so that production lines can be implemented quickly for a fast return on investment.

Half of the cost reduction of batteries is accounted for by improved productivity, and digital technology can help make this possible through real-time monitoring, Christel Galbrun-Noel, mobility segment president at Schneider Electric, told BNEF. The French company helps battery makers improve the quality of battery scrap and cut the time taken for formation and ageing of batteries through digital technologies.

Around 50% of operating expenses come from the energy consumed in battery making, so Schneider installs sensors on machines to improve efficiency and can arrange renewable energy supply.

Siemens AG also provides consulting on automation and digital equipment to many of Europe's battery making endeavors, including Northvolt and the Saft alliance. The company enables manufacturers to build a blueprint of a factory in digital form, and replicate it in different locations, Ralf Stefes, vice president of emerging markets at Siemens, told BNEF. Key areas of focus include reducing battery scrap (currently more than 30%) and scaling up production, because Europe will need to build factories fast if it is to meet battery demand of 300GWh by 2025, Stefes said.

Given that battery packs currently account for 30% to 40% of an electric vehicle's cost, bringing more of that production to Europe would not only cut CO2 emissions in transport and promote sustainable supply chains, but significantly reduce associated costs too.

Northvolt Ett in Sweden, under construction

Source: Northvolt

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Contact details

Bryony Collins	Editor, BloombergNEF
Angus McCrone	Chief editor, BloombergNEF

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