Battery makers are facing a deeply uncertain decade ahead, as automakers jostle for access to the cheapest and most suitable technologies for their increasingly electric-powered fleets, warned investment firm Moody's last week.

Even as the world's biggest battery companies pour billions of dollars into new production facilities and pursue supply deals with carmakers, it's far from clear which battery chemistry will emerge as the preferred energy source for tomorrow's electric vehicles, Moody's Investors Service wrote in a research note published Friday.

"Technology risk is high in EV battery manufacturing as material composition of batteries continues to evolve," Moody's said, adding that "it remains unclear which battery technologies ... will eventually prevail."

Already, some battery makers and automakers, like Tesla Inc. and China-based Contemporary Amperex Technology Company Ltd., or CATL, are moving toward lithium-ion batteries that use less cobalt or phase it out entirely. The mineral is sourced typically from the Democratic Republic of Congo and has been linked to human rights violations in its supply chain.

Over the 2020s, a deeper technology shift could occur, partly because of the emergence of solid-state batteries, which use a radically different mix of components than lithium-ion models, the report said.

Fires or other unforeseen issues with battery technology could also hurt companies' profitability, analysts wrote. At the same time, the growth of the EV industry overall could be lucrative for battery makers, Moody's said.

According to Sara Hastings-Simon, senior researcher at the Payne Institute for Public Policy at the Colorado School of Mines, whether a given battery company can turn a profit isn't the same thing as whether there will be enough batteries to feed the transition to electric vehicles.

"There's got to be investors who believe they can make money, but I would really separate those two questions," she said.

"There certainly can be bumps in the road for capacity expansion, over a short time frame. But there's not a lot in the investment risk side that makes me particularly concerned about EV availability," added Hastings-Simon.

Biden, DOE and Bill Gates

The battery industry's technological flux may pose dilemmas for
policymakers looking to create a U.S.-based source of supply, as the Biden administration aims to do. Last week, Biden ordered the Energy Department to review risks in the supply chain for EV batteries and recommend ways to address them, in a report to be delivered in 100 days (Energywire, Feb. 25).

And a trade dispute between LG Chem Ltd. and SK Innovation Co. — two of the top three battery producers with plans for the U.S. — has recently raised questions about the stability of EV battery supplies. SKI was banned from importing components for its two planned factories in Georgia after being accused of stealing secrets from LG Chem, leading some analysts to predict complications for the U.S. EV market (Energywire, Feb. 18).

Building a flourishing battery industry in the U.S. — from mines to battery assembly — has been not just a priority but also a favorite talking point for the Biden administration. In an interview with NPR last week, Energy Secretary Jennifer Granholm answered a question about trade policy for solar panels by pivoting to the importance of encouraging domestic mining for battery minerals.

"We have to decide as a nation, is this important for our national security? Is this important for our energy security? Yes, it is, and that means a partnership with the government and the private sector," she said.

The report ordered by Biden last week is likely to focus on supply chains for compounds used in batteries like lithium iron phosphate and nickel manganese cobalt.

Haresh Kamath, a senior program manager for energy storage at the nonprofit Electric Power Research Institute, noted that some battery manufacturers are producing both types. "I don't know that this is an existential question to the degree that some folks out there have portrayed it," Kamath said.

Manufacturing processes for those compounds also tend to have much in common, added Kamath. The real divergence would happen with solid-state batteries. "When it comes to solid state, things may be very different," Kamath said.

Deep-pocketed investors like Bill Gates' Breakthrough Energy Ventures and Volkswagen AG are betting that solid-state batteries, which transfer energy between the cathode and anode using a solid material rather than a liquid, will eventually outperform lithium-ion batteries.

One startup with backing from Gates' group, QuantumScape, has raised billions of dollars in capital since going public via a special purpose acquisitions company, and it has a deal to scale up its prototypes for Volkswagen's vehicles (Energywire, Dec. 9, 2020).

A breakthrough in one technology may not mean every automaker adopts it, said Kamath.

"These different technologies can co-exist," he said. "I don't think it's likely that one will completely dominate — unless the customers want it that way."

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