Climate Capital **Batteries**

QuantumScape: can battery pioneer live up to the hype?

Breakthrough lifted group to $50bn valuation, but stock has fallen almost 60 per cent since peak

Jagdeep Singh, QuantumScape founder and chief executive © FT montage

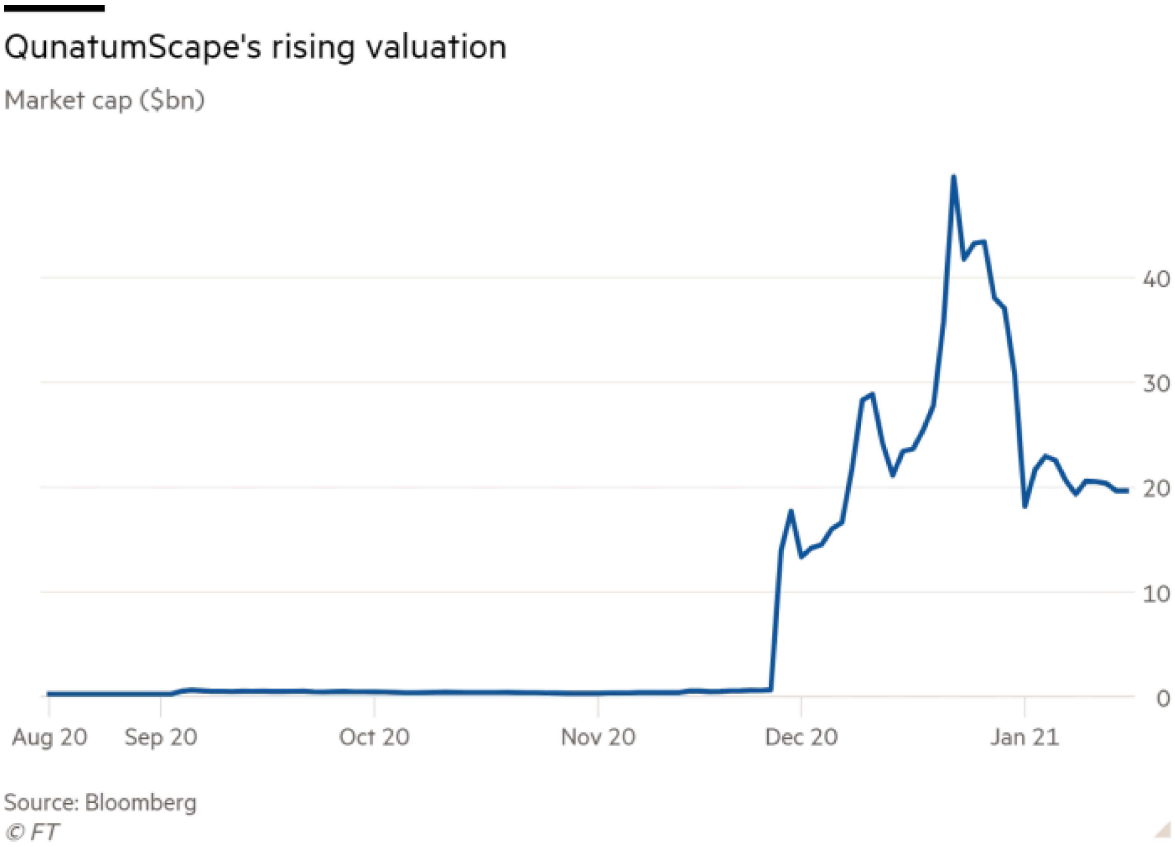
Henry Sanderson JANUARY 20 2021

QuantumScape sped to a near-$50bn valuation last month after reporting a battery breakthrough that would help make electric vehicles "the world's dominant form of transportation". Its subsequent plunge has highlighted the perils of joining the rush into technology stocks — particularly those in the race to take battery-powered vehicles to the masses.

After listing via a reverse merger in November, shares in the Silicon Valley start-up tripled as investors bet that its solid-state technology heralded cells that would give a game-changing boost to vehicles' range and cut charging times.

But the stock has dropped almost 60 per cent since its peak on December 22 amid fears that QuantumScape may just be the latest hyped-up battery group that will not deliver on its early promise.

The company has never earned any revenue and has only tested a single-cell prototype. To justify its still lofty valuation — its market capitalisation remains about $20bn — it needs to scale up its technology in the face of competition from global heavyweights including Samsung, Toyota, Panasonic and France's Bolloré Group.

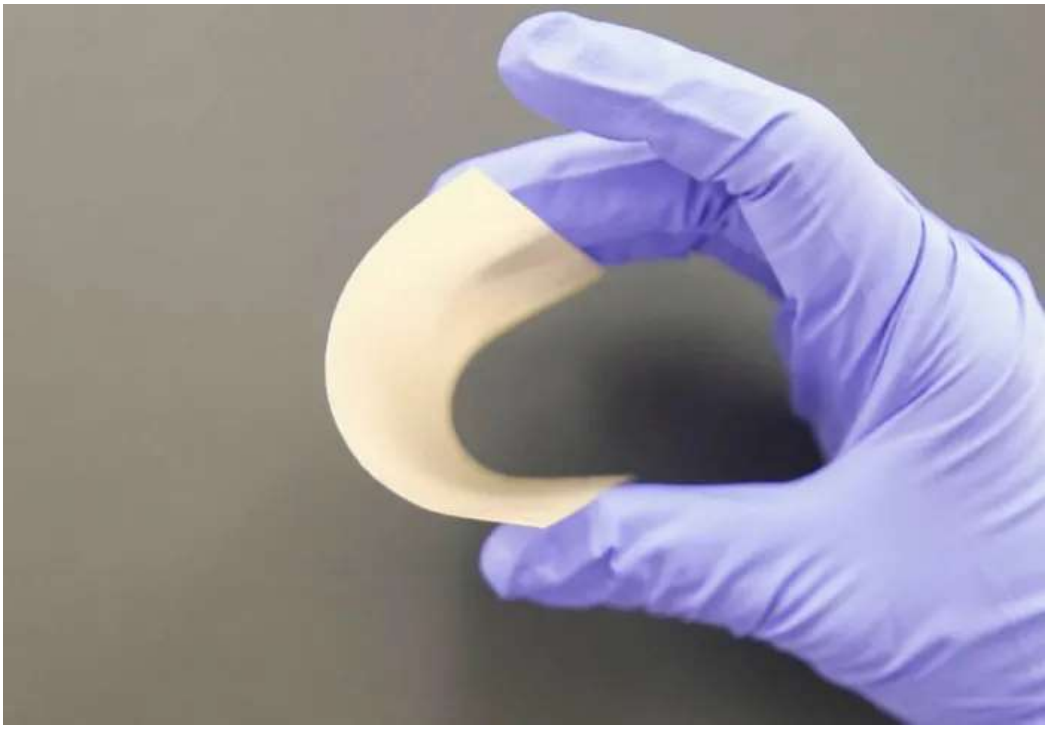


“I’m not that convinced yet,” said Billy Wu, a battery expert at Imperial College London. “There have been loads of solid-state companies that have come and gone in the past as it’s just really hard to do.” Making something at scale, he said, was a “million miles away from doing it in the lab”.

QuantumScape was co-founded in 2010 by India-born Jagdeep Singh along with two Stanford University scientists. The former telecommunications entrepreneur, who came to the US aged 15 and graduated in computer science four years later, aims to supply batteries to the global car industry.

QuantumScape said last month it had overcome the hurdles that for the past half-century had prevented the development of a solid-state battery, which uses solid electrolytes rather than the liquid ones in conventional lithium-ion cells.

It revealed a ceramic material it had developed, about the size of a playing card and as thin as a human hair, that enabled its batteries to be charged to 80 per cent capacity in 15 minutes. In lab testing at room temperature the cells maintained their capacity through 1,000 one-hour charging and discharging cycles, meaning a theoretical life of 300,000 miles for a Tesla Model S.



QuantumScape's ceramic solid-state separator © QuantumScape

Key to the material is that it allows the use of lithium at the battery's negative electrode rather than conventional graphite. The metal has up to ten times the storage capacity of graphite, the removal of which makes the cell lighter and smaller, Mr Singh said.

The company is targeting an energy density of close to 400 watt-hours per kilogramme, from roughly 260Wh/kg in today's electric vehicles.

A panel discussion held by QuantumScape last month featured prominent supporters of its technology, propelling much of the hype.

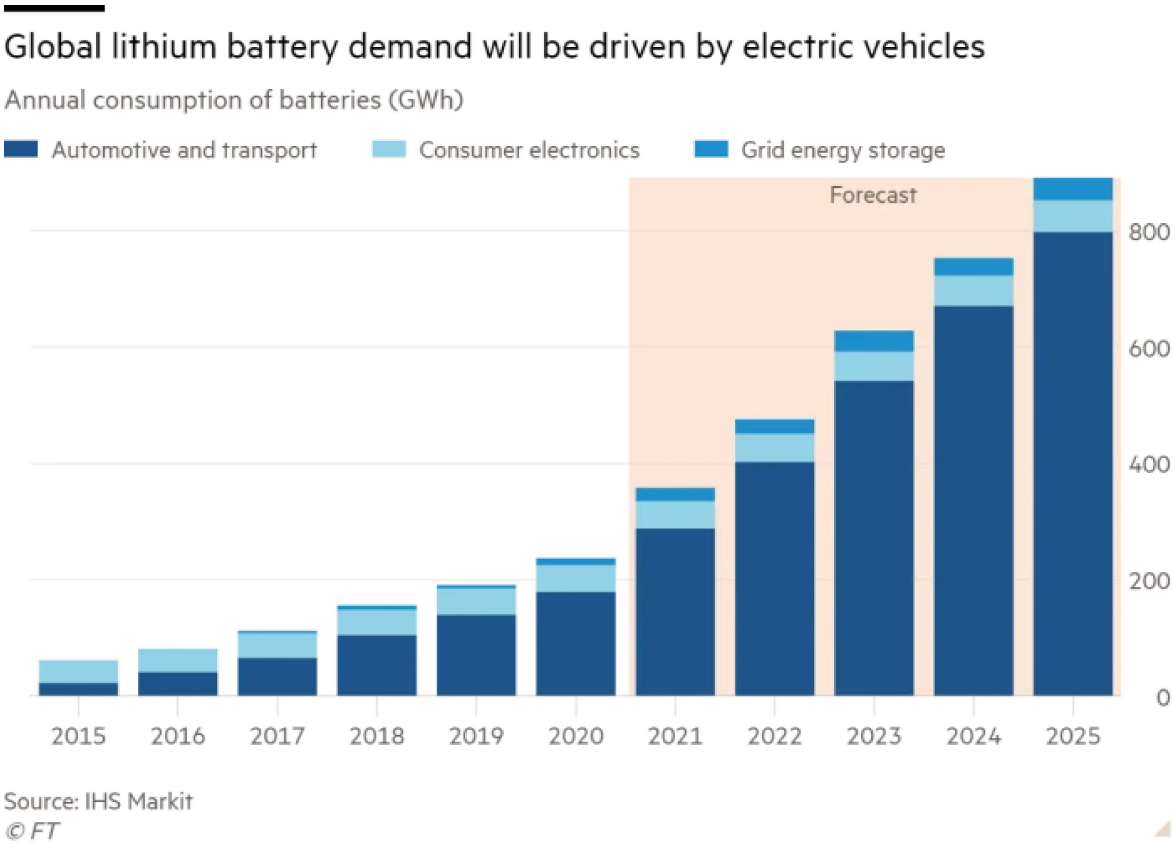
"I have not seen data this good anywhere else," said Stanley Whittingham, who last year shared the Nobel Prize in Chemistry for his work on lithium-ion batteries. "So I think it's a real breakthrough. We just have to make the cells bigger and get them into cars."

JB Straubel, Tesla co-founder, said that while he was inherently sceptical about claims made for battery technologies, QuantumScape's performance data was "game-changing".

"To me this fundamentally puts the lithium chemistry battery on kind of a different road map for innovation," he said. "Seeing these kind of performance numbers is almost unheard of — a 50 per cent improvement, roughly, in energy density volumetric, is incredible."

But other battery scientists, including Mr Wu, caution that going from one cell to the dozens required for an electric car's battery pack will require a lot more time, research and development.

Rivals, meanwhile, are further along the road to a viable product. Colorado-based start-up Solid Power, which is backed by Ford, said last month it had tested its solid-state cells in 22 layers and recorded an energy density of 330Wh/kg.



Peter Bruce, a professor at Oxford university who worked with lithium-ion battery inventor John Goodenough in the 1980s, said companies needed to demonstrate high energy density and longevity in real-world conditions, not only in the laboratory.

“While there have been important advances in solid-state batteries there remain problems to be solved,” he said. “Solid-state batteries will need to be significantly better than the best lithium-ion batteries in order for automotive companies to adopt them.”

Mr Singh insists that the only risk investors are taking lies in the company’s execution and that its technology has been proved to work. Comparing the challenge to scaling up production of a raincoat, he said: “You don’t want to worry about fashioning the garment until you first have the fabric.”

Volkswagen, which has invested $300m in QuantumScape and hopes to deploy its cells in 2025, has also committed an undisclosed sum to help it build a pilot factory. But while the German carmaker has the right to buy the first batteries produced, QuantumScape can then sell to any buyer.

“We are not a Tesla competitor,” Mr Singh said. “We’re a battery company. I see no reason why every car company wouldn’t be a potential customer of ours.”

For now, many investors are keeping the faith. But observers warn that QuantumScape’s valuation remains overblown.

“I don’t think there’s anyone knowledgeable in the stock saying it’s worth that much because the maths doesn’t add up,” said Mark Newman, an analyst at Bernstein. “You have to assume that the numbers are better than projected with zero risk to get to that number.

The solid-state battery race

Nio: The Chinese electric car start-up said this month that its electric saloon launching next year would have a solid-state battery with an energy density of 360Wh/kg. It did not reveal its supplier.

Toyota: The Japanese carmaker is set to launch a solid-state battery in vehicles at the Tokyo Olympics scheduled for this year. It has also partnered with Panasonic to develop the technology.

Samsung: The Korean group has released data showing that its solid-state battery can be charged and discharged 1,000 times and will provide a range of up to 800km.

Bolloré Group: The French industrial group has already deployed its solid-state batteries in a car-sharing service in Paris and in electric buses, although they require high temperatures to work. The company says it can have a battery that can work at room temperature by 2025-2026.

Ganfeng Lithium: China’s largest lithium producer says it is testing its solid-state batteries with carmakers, and aims to have a commercial product in the next couple of years.

Additional reporting by Kana Inagaki in Tokyo and Patrick McGee in San Francisco

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