

17<sup>th</sup> October 2022

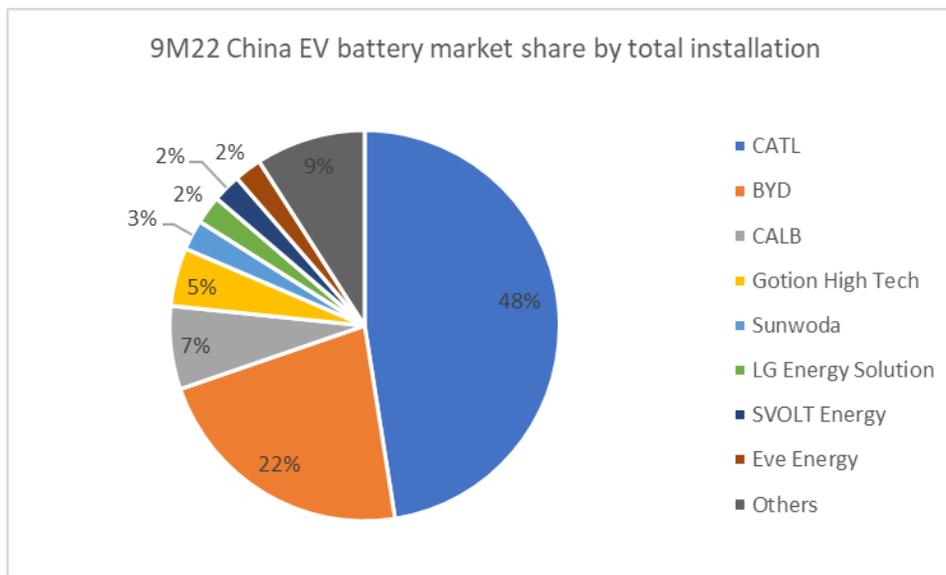
### Zoom on the Chinese EV battery makers

In the first nine months of 2022, additional installation of batteries for Electric Vehicles (EV) across China was 193.7GWh according to China Automotive Battery Innovation Alliance (CABIA) data. It represented a 110.5% increase year-over-year.

The top 8 suppliers within the China market accounted for 90.9% of the supply (see Figure 1). They are CATL (the short name for Contemporary Amperex Technology Company Limited – market cap USD145bn), BYD (the largest EV manufacturer in the world – market cap USD97bn), CALB (market cap USD8bn), Gotion High Tech (24.8% owned by Volkswagen – market cap USD8bn), Sunwoda Electronic (market cap USD6bn), LG Energy Solution (from Korea – market cap USD80bn), SVOLT Energy (an unlisted subsidiary of Great Wall Motors that is reportedly looking for a listing on the Hong Kong market) and Eve Energy (market cap USD24bn).

Among the other smaller suppliers to the Chinese EV sector is the Japanese Panasonic which does not list among the top eight suppliers.

**Figure 1. China EV battery market share by total installation**



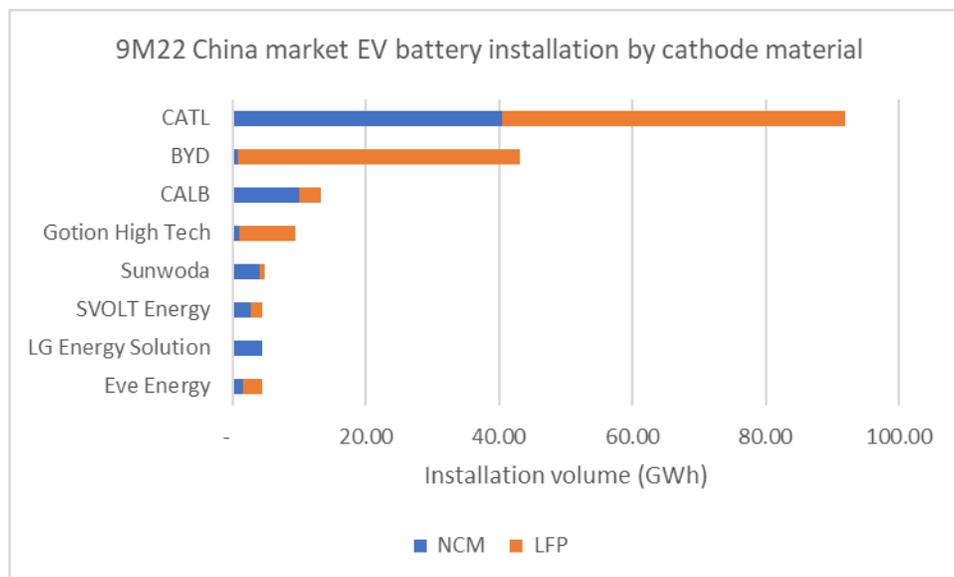
Source: China Automotive Battery Innovation Alliance, JK Capital research

Broken down by cathode material, around 40% of the installation came from ternary lithium batteries (using nickel, cobalt, manganese, typically referred to as “NCM” as the cathode material) while 60% were “LFP” batteries (using lithium iron phosphate as the cathode material). That mix was 51%/49% during the same period last year.

LFP batteries outgrew NCM batteries over the past year as LFP batteries are cheaper to produce. Even though their autonomy is typically not as high as what NCM batteries can offer, automobile manufacturers have realised that many smaller car buyers did not need a very high autonomy as they focused more on their budget. Furthermore, LFP batteries do not use cobalt, a metal that is typically mined under highly controversial conditions (largely in the Democratic Republic of Congo), creating significant ESG issues within the supply chain.

The mix of NCM and LFP batteries varies widely among the top power battery makers (see Figure 2).

**Figure 2. The mix of NCM and LFP batteries varies widely among top power battery makers**

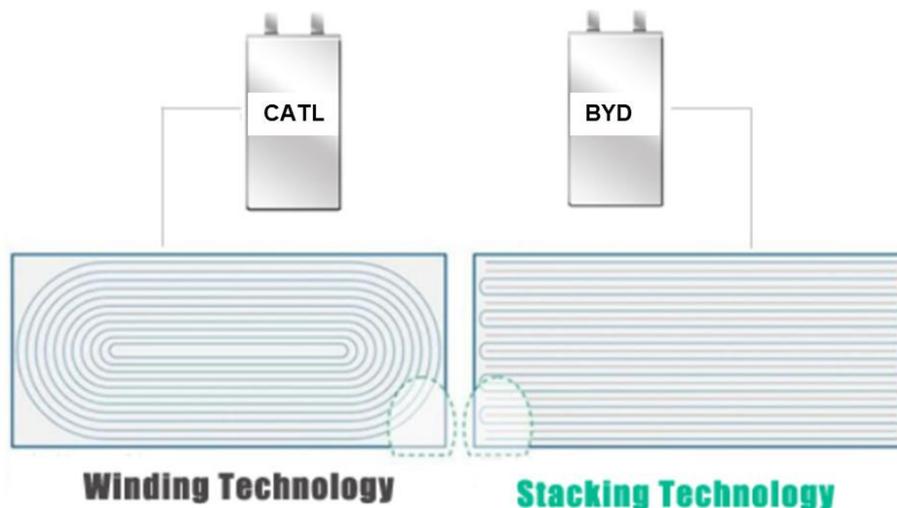


*Source: China Automotive Battery Innovation Alliance, JKC Research*

CATL, the world's largest EV battery maker with a total domestic installation of 92.02GWh in 9M22, has adopted a balanced approach between NCM and LFP batteries. In terms of battery format, whether the batteries are of NCM or LFP type, they are all using a prismatic shape. This is about to evolve as the company is rumoured to be developing cylindrical batteries for Tesla and BMW, with mass production expected in 2024.

BYD, the world's second largest EV battery maker with a total domestic installation of 43.06GWh in 9M22, is devoted to LFP solutions. BYD is also famous for using prismatic shaped battery cells, but they are different from CATL's prismatic cell technology as CATL's lithium battery electrodes and separators are combined using a winding technology as opposed to the stacking technology that is being used by BYD (see Figure 3). Stacking technology can fully utilize the space within a cell, providing a higher energy density on a per-cell basis, whereas winding technology allows much faster production speed with typically lower defective rates.

**Figure 3. Winding technology vs stacking technology for prismatic cell production**

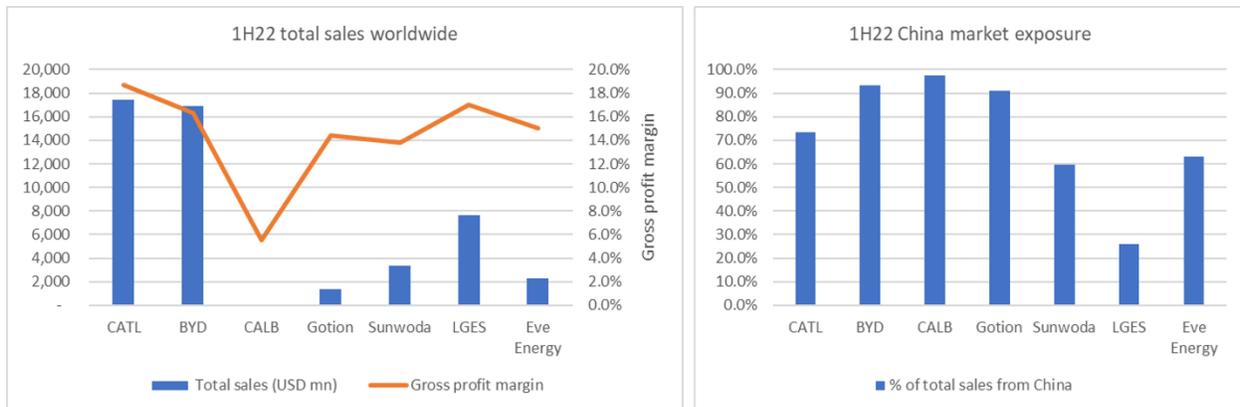


The third largest domestic EV battery maker, CALB, is less well-known to investors. CALB had a total installation of 13.33GWh in 9M22, a 136% increase year-over-year that was higher than the average industry growth. The company recently got listed on the Hong Kong stock exchange. It is more focused on NCM cathode material solutions than it is on

LFP, as can be seen from Figure 2 above. CALB also makes prismatic shaped battery cells and adopts both winding and stacking technologies.

Another major name to highlight is LG Energy Solution, the EV battery subsidiary of the Korean LG group that was spun off from its parent in January 2022 and obtained a separate listing. LGES ranked as global number three by August 2022 installation volume. LGES is more oriented towards European and American markets than it is on Chinese car manufacturers: It only has 26% of its total sales in China (see Figure 4), hence its much smaller market share on the Chinese market compared to CATL and BYD. In terms of cathode material, LGES has been devoted to NCM solutions, but it is reported to be developing LFP types of batteries. In terms of battery format, LGES is famous for pouch batteries, but its capacity in China is mainly focusing on cylindrical batteries upon Tesla’s specific request. Pouch battery solutions have high energy density but are more expensive as the production process is hard to standardize and as the key components are largely imported.

**Figure 4. Financial summary of the listed top EV battery players**



Note 1: The reported numbers for BYD combine batteries, automobiles, auto components and photovoltaic products. No specific breakdown is provided by the company for its battery segment.

Note 2: CALB: FY21 financials as 1H22 financials are not available yet.

*Source: Bloomberg, Company filings, JK Capital*

The China Passenger Car Association (CPCA) recently disclosed for the first time the customer profile of the top EV battery makers, based on August 2022 installation volumes.

CATL's volume can be broken down into 18% Tesla, 12.3% Geely, 7.4% Nio, 6.3% FAW-Volkswagen, and 5.8% Chang'an Automobile. It is arguably a well-balanced portfolio of clients.

BYD is 95.6% sold internally as BYD is the largest manufacturer in the world of electric cars. The balance is spread among other local brands.

CALB has 79.8% volume supplied to Aion (part of the Guangzhou Auto group), 7.1% to Leapmotor, 4.4% to Xpeng, 3.3% to Ruichi EV (a brand under Chongqing Sokon), and 1.3% to Geely.

Gotion High Tech which counts Volkswagen as its lead investor saw its sales broken down as 21.0% to Chang'an Automobile, 20.3% to SAIC-GM-Wuling that is famous for its mini EV models, 12.7% to Cherry, and 11.2% to Leapmotor.

As to LG Energy Solution, 99.8% of its China market installation volume is to Tesla China.

One can easily conclude that the EV battery market is very diversified in the sense that each manufacturer has its own design of battery cells and packs in order to strike a balance between performance (e.g. energy density, battery life, operating range given different environments), affordability, and safety, and often at the request of its clients.

There is no definite answer as to which roadmap is the best. The production techniques and manufacturing equipment also evolve alongside the design of battery cells while battery makers always seek to achieve a greater level of automation.

---

*The information contained herein is issued by JK Capital Management Limited. To the best of its knowledge and belief, JK Capital Management Limited considers the information contained herein is accurate as at the date of publication. However, no warranty is given on the accuracy, adequacy or completeness of the information. Neither JK Capital Management Limited, nor its affiliates, directors and employees assumes any liabilities (including any third party liability) in respect of any errors or omissions on this report. Under no circumstances should this information or any part of it be copied, reproduced or redistributed.*