Global Battery Market

First movers will likely keep their leads

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S&P Global
Ratings

This report does not constitute a rating action

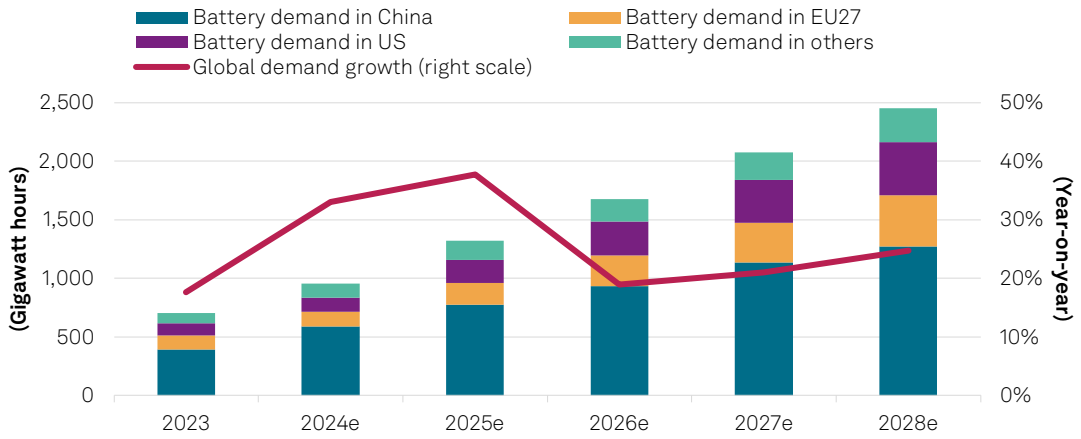
Key Takeaways

- What do we expect over the next 12-24 months?
    - We anticipate slowing growth in electric vehicle (EV) sales in Europe and U.S. ; **the ongoing electrification trend will still support long term growth** in global EV batteries.
    - **Chinese and Korean battery players will remain in the lead** in the global battery market on their technology advantages and strong ties with automakers in the next few years at least.
    - **We will likely see market consolidation in China's battery market** under the new guidance by the Chinese government to improve overcapacity issues.
- Credit implications:
    - Economies of scale and rollouts of new, better-priced products will likely **improve profitability for Contemporary Amperex Technology (CATL) (A-/Stable/--)**. We anticipate its free operating cashflow (FOCF) will further increase over the next two years, deepening its net cash position;
    - **Investment burdens remain high for LG Energy Solution Ltd. (LG EnSol) (BBB+/Negative/--),** given its aggressive capacity expansion amid slowing EV growth in its key markets. This will likely elevate its debt-to-EBITDA to 2.5x-2.6x in 2024-2025 from 1.5x in 2023.
- Rating trends:
    - Solidified business strength and sustained net cash position supports the **stable rating outlook on CATL.**
    - **The negative outlook on LG EnSol** reflects our view that the high capital expenditure (capex) needs for the EV battery division could pressure the financial metrics of its parent LG Chem. We equalize our rating on LG EnSol to that on its parent, given its core subsidiary status.

Global Battery Demand Will Further Grow In 2024-2025, Driven By China

- We estimate the global battery market will see 30%-40% annual growth in 2024-2025, mainly supported by our anticipated sales growth of electric vehicles (EVs) in China. Fading EV subsidies in Europe and less aggressive emission standard targets in U.S. could moderate EV sales and battery demand growth in these regions during the period.
- That said, meaningful launches of EVs at more affordable prices and net-zero emission targets by different carmakers and countries will still support sustainable EV demand growth over the long term.
- Batteries are the core component of EVs and contribute to 30%-50% of EVs' production cost. We believe batteries will maintain a solid long-term growth trajectory.

Battery demand growth remains solid



Data as of Sept 24, 2024. e--Estimate. Sources: S&P Global Ratings, S&P Global Market Intelligence, S&P Global Mobility.

EV penetration will continue to grow

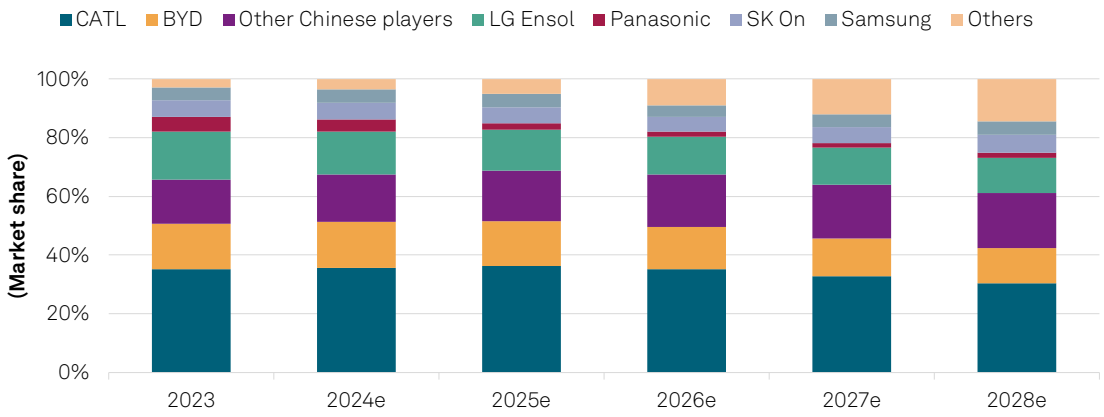
Region/Countries	2023	2024e	2025e	2026e	2030e*
Europe 10	22.2%	<20%	20%-25%	20%-25%	55-60%
China (Mainland)	32.9%	Approx. 40%	44%-48%	48%-52%	70%-75%
U.S.	9.2%	10%-11%	13%-16%	16%-22%	30%-35%
Global	16.5%	18%-19%	19%-20%	20%-22%	45%-50%

Europe 10--Germany, France, U.K., Italy, Spain, Belgium, Austria, Netherlands, Sweden, and Norway. e--Estimate. BEVs--Battery electric vehicles. PHEVs--Plug-in hybrid electric vehicles. *2030 production projections by S&P Global Mobility. Source: 2019-2023 EV Volumes; 2025 estimates by S&P Global Ratings.

The Market Leaders Will Stay In Front

- We believe the global top players will continue to lead the market over the next few years. Their edge on battery technology and meaningful capacity available will support business growth and sustain strong ties with automakers.
- Nevertheless, their strengths will keep to a geographical focus. Chinese players will dominate the Chinese market. Meanwhile, they will gradually expand in Europe and take European share from Korean players. Korean players will focus their growth strategy in the U.S.
- Localization polices for battery supply chains will support market share expansion of emerging players (e.g. Northvolt, Power Co). But their shares will likely remain limited given leading players have pricing advantages from economies of scale.

Asia players will remain dominant in global battery market



Market share in terms of estimated demand. e--Estimate. Sources: S&P Global Ratings, S&P Global Mobility.

Top three players have edge in specific areas

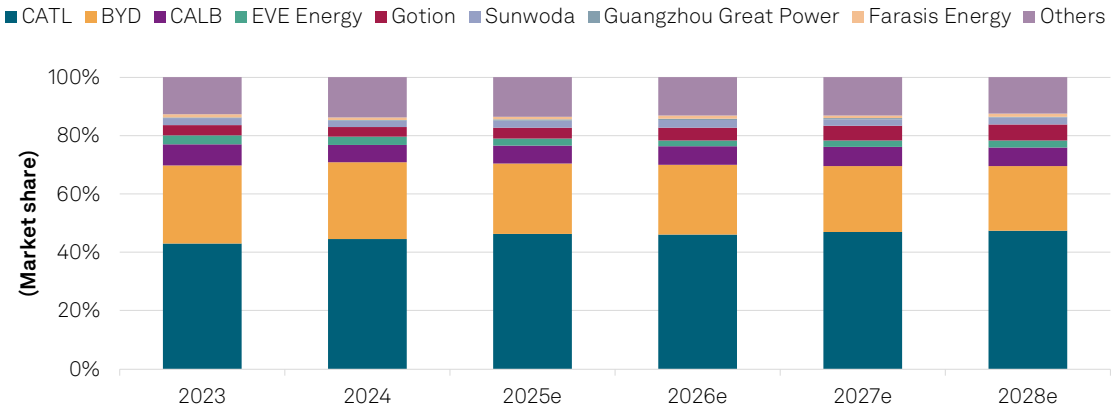
Company name	CATL*	BYD*	LG EnSol*
Rating	A-/Stable/--	Non-rated	BBB+/Negative/--
Battery form	Prismatic, cylindrical	Prismatic	Pouch, cylindrical
Est. chemistry mix of sales volume in 2023§	60% NCM; 40% LFP	100% LFP	60% NCM; 40% NCMA
Major battery technology	(1) Fast charging LFP: Shenxing Plus; (2) Cell-to-Pack : Qilin Battery (3) Cell-to-Chassis	(1) Blade Battery LFP technology (2) Cell-to-Pack (3) Cell-to-Body	(1) High-nickel NCMA batteries (2) NCM batteries (3) Pouch-type cell-to-pack LFP

*CATL--Contemporary Amperex Technology Co., Ltd. BYD--BYD Co. Ltd., LG EnSol--LG Energy Solution, Ltd., §NCM--Nickel-Cobalt-Manganese, LFP--Lithium iron phosphate, NCMA--Nickel Cobalt Manganese Aluminum.
Sources: S&P Global Ratings, S&P Mobility.

Market Consolidation In China Benefits Dominant Local Players....

- Chinese battery players have been expanding quickly to meet demand from China's fast-growing EV market, especially in prior years. Emerging or foreign players are unlikely to meaningfully scale up in China due to first- mover advantages of incumbent local players.
- New battery guidance in China will likely encourage market consolidation and benefit leading players. The Chinese government has raised industry technology standards and minimum utilization targets for industry players as of June 20, 2024.
- Weaker players will likely be squeezed out and this will gradually improve the country's overcapacity issue over the next few years.

Chinese players will remain dominant in China



Market share in terms of estimated demand. e--Estimate. Sources: S&P Global Ratings, S&P Global Mobility.

Chinese government is trying to improve supply issue

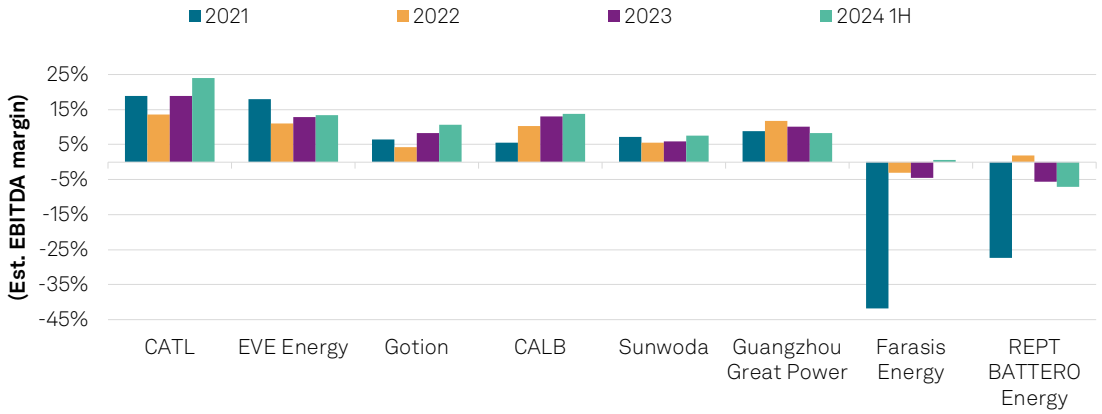
Requirements	Details on EV batteries	Industry status
Energy density	• NCM battery cell: ≥230 Wh/kg ; NCM battery pack ≥165 Wh/kg; • Battery cell with other materials (e.g. LFP): ≥165 Wh/kg; battery pack with other materials: ≥120 Wh/kg.	2024 first 7 months: 82% of battery pack with energy density of 125wh/kg – 160wh/kg
Life cycle	• Battery cell: cycle life ≥1500 times ; capacity retention rate ≥ 80% • Battery pack: cycle life ≥1000 times ; capacity retention rate ≥ 80%	N.A.
R&D expenses	Battery manufacturers needs to invest at least 3% of their main business revenue annually on research and development of battery technology	N.A.
Utilization	Actual production volume of the year ≥ 50% of production capacities	Some lower tier players have <30% utilization

Sources: The Ministry of Industry and Information Technology, China Automotive Battery Innovation Alliance, Gaogong Industry Research Institute, S&P Global Ratings.

...But Slowing Market Growth Will Further Intensify Competition In China

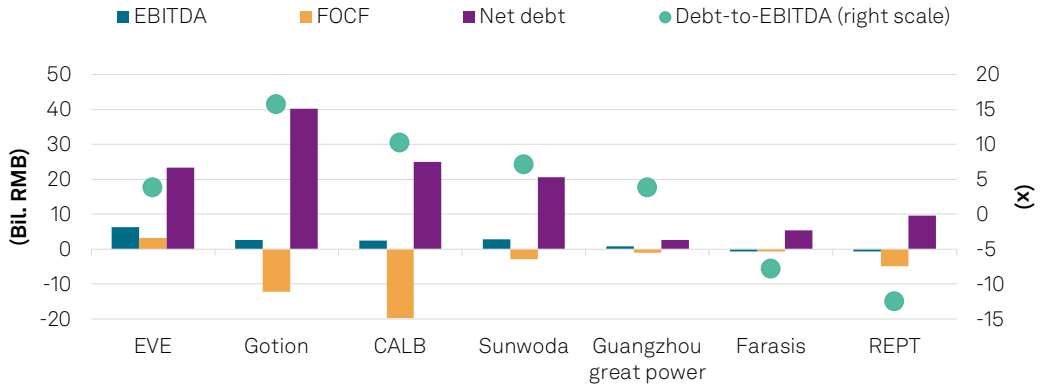
- We anticipate EV market growth in China will decelerate to about 30% in 2024 from higher double digits in prior years.
- The EV battery installation-to-production ratio declined to 47% in 2024 first half, compared with 70% in 2021, as EV demand growth slowed and battery production rose.
- China's crowded market has weakened pricing power in the industry. Weaker players have less competitive product offerings and could lose volume and face weaker profitability over the next one to two years.
- Excess battery supply and further free operating cash outflows for many players will elevate their debt leverage.

Some lower-tier players are struggling...



Only CATL is rated. Data of other entities are our estimates based on their annual and interim reports. Source: S&P Global Ratings.

... And many are highly leveraged from capacity expansion

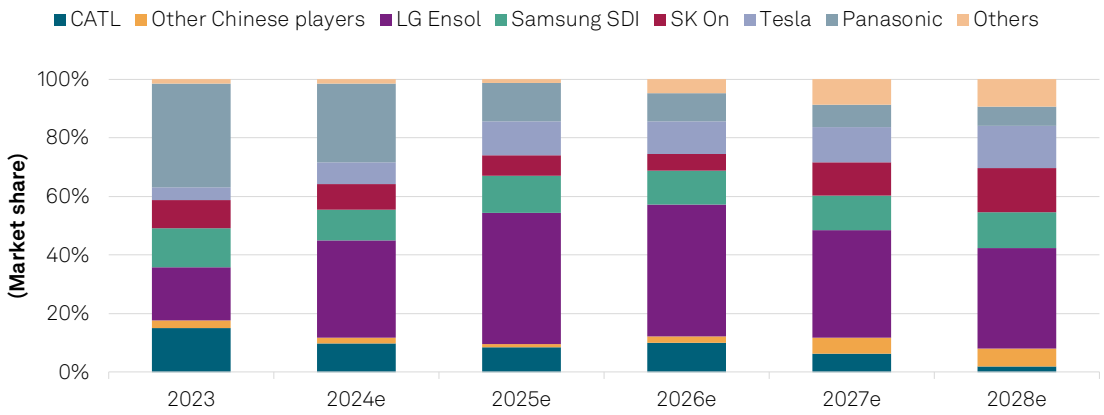


Data of above entities are our estimates based on their 2023 annual reports. Farasis and REPT's debt-to-EBITDA ratios are negative due to their negative EBITDA. FOCF—free operating cashflow. Source: S&P Global Ratings.

Korean Producers' Investment Burdens Remain Significant In U.S. Market

- Korean battery players will likely continue to prioritize expansion in the U.S., supported by Advanced Manufacturing Product Credit (AMPC) available under the Inflation Reduction Act.
- Weakening EV demand growth in U.S. could delay capacity expansion. Also, subject to the presidential election results, there may be changes to the production incentive programs. Yet, investments by Korean battery makers remain substantial for capturing share in the region.
- We believe the majority of Chinese players will refrain from meaningful direct investments due to intensifying tension between China and the U.S. Given the U.S.'s "foreign entity of concern" clause, Chinese battery players won't easily get tax-incentive entitlements so wouldn't be as cost competitive in the U.S.

Korean firms will dominate North America market



Market share in terms of estimated demand. e--Estimate. Sources: S&P Global Ratings, S&P Global Mobility.

Capacity additions in the U.S. being delayed or cancelled

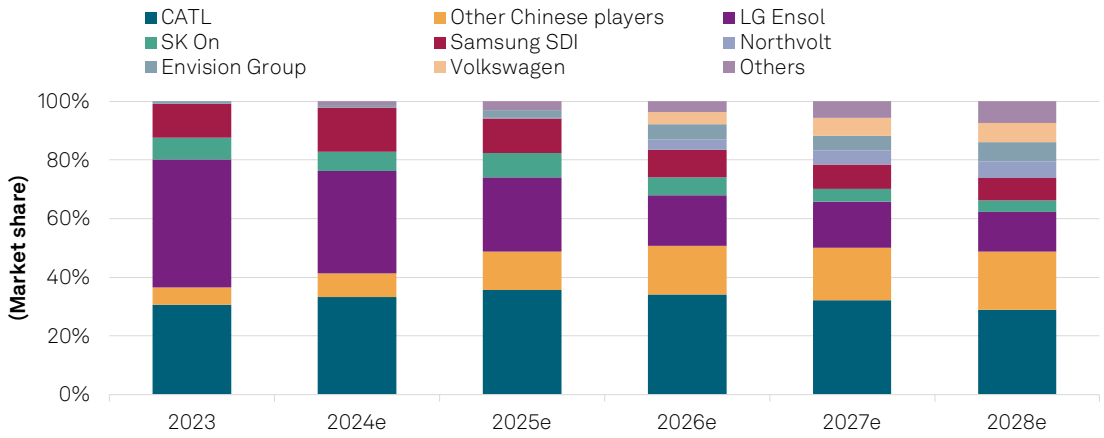
Battery producers	OEM partner	Battery plant	Planned capacity	Status
LG EnSol	General Motors	Michigan plant	45Gwh	Strategically reviewing
LG EnSol	N.A.	Arizona energy storage plant	17 Gwh	Held off
SK On	Ford Motor	BlueOval SK Battery Park	80+ Gwh	Postponed to start after 2026
Panasonic	Tesla	Third plant in U.S.	N.A.	Announcement date is delayed
Microvast	N.A.	Kentucky	19 Gwh	Cancelled

Gwh--Gigawatt hour. The above list is non-exhaustive. Sources: Companies' announcements, S&P Global Ratings.

The Competitive Landscape In Europe Is Still Evolving

- Chinese and European players are gradually ramping up battery capacity in Europe and will, in our view, take share from Koreans, the traditional leaders in Europe, over the next few years.
- That said, likely slowing EV growth in the region could hinder progress. A number of battery producers have announced cancellations or delays of their expansion plans, mainly on insufficient secured orders.
- Chinese players have price advantages that will support further penetration via battery exports over 2024-2025. We estimate battery cost in China will remain at least 30% lower than locally produced batteries in Europe during the period. This is mainly due to cheaper material processing/refining costs and lower labor and manufacturing costs in China.

Competitive landscape in Europe is still evolving



Market share in terms of estimated demand. e--Estimate. Sources: S&P Global Ratings, S&P Global Mobility.

Recent announcements of capacity delays in Europe

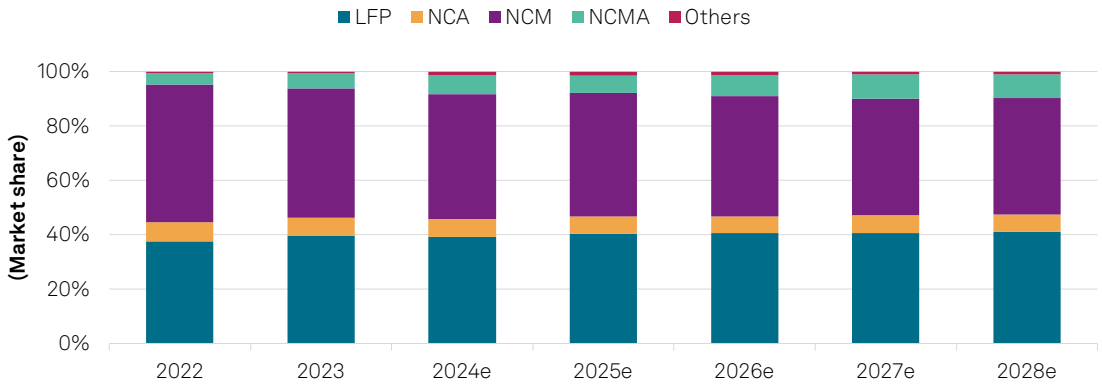
Battery producers	OEM partner	Battery plant	Planned capacity	Status
Northvolt	BMW	Sweden plant	60 Gwh	Strategically reviewing
ACC	Stellantis and Mercedes	Italy and Germany plant	40 Gwh each	Paused
SVOLT Energy	N.A.	Germany	16 Gwh	Cancelled
PowerCo	Volkswagen	Fourth plant in Europe	N.A	Delayed

The above list is non-exhaustive. Sources: Companies' announcements, S&P Global Ratings.

New Technology Could be A Game Changer But It Will Take Time

- We expect solid state battery (SSB) will be a revolutionary technology. This is because SSB has high energy density, lower pack component costs, and reduced flammability.
- Some battery players are targeting to mass produce SSB as early as 2026. That said, we anticipate the market share of SSB will remain less than 2% until 2030. This is because initially the price of SSB will be at a premium to liquid state batteries, partly because of low available capacity for production. The capacity build-out will take time, given the manufacturing process of SSB is different.
- Meanwhile, LFP- and NCM-related cathode chemistry will continue to be widely adopted by automakers over the long term. Other cathode chemistry could be hard to scale up due to instability of battery performance, low energy density or affordability.

LFP- and NCM-related technology will remain dominant



Market share in terms of estimated demand. LFP--Lithium iron phosphate, NCMA--Nickel Cobalt Manganese Aluminum, NCM--Nickel-Cobalt-Manganese, NCMA--Nickel Cobalt Aluminum. e--Estimate. Sources: S&P Global Ratings, S&P Global Mobility.

Many players have no specific capacity target on SSB

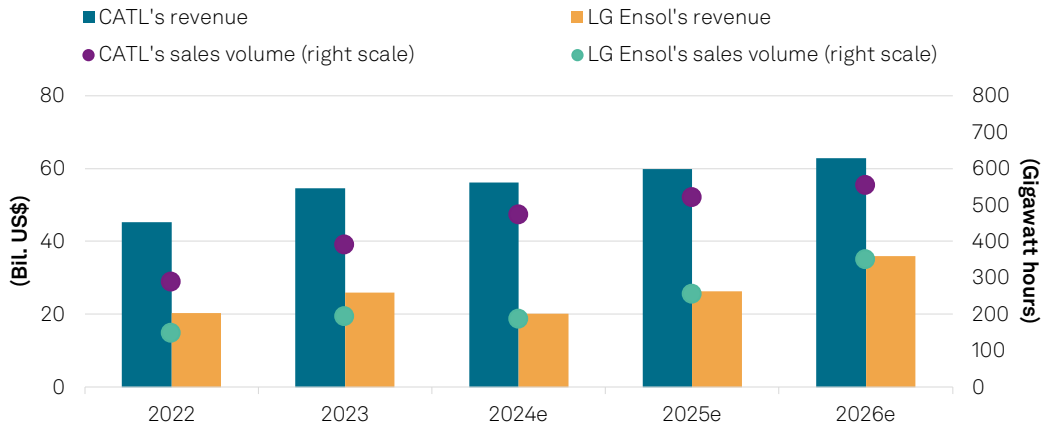
Battery producers	Technology partner	Planned capacity	Targeted production year
CATL	N.A.	Small batches	2027
BYD	N.A.	Small batches	2027
LG EnSol	N.A.	N.A.	2030
Samsung SDI	N.A.	N.A.	2027
SK On	Solid Power	N.A.	2027
Toyota	N.A.	N.A.	2027
Panasonic	N.A.	On small drones	2029
PowerCo	QuantumScape	40 Gwh	2026

The above list is non-exhaustive. Sources: Companies' announcements, S&P Global Ratings.

CATL Will See Higher Growth Than LG EnSol Over Our Forecast Period

- CATL will likely expand annual sales volume by 10%-21% over 2024-2025. Drivers include the growing EV market in China, with some production gradually expanding to Europe. This will mitigate the impact of lower battery prices and support 3%-7% annual revenue growth over this year and the next.
- CATL will also test a licensing, royalty, and services model to cooperate with U.S. automakers. This approach, if implemented smoothly, will likely help the company to mitigate geopolitical risks.
- Meanwhile, we expect LG EnSol's EV battery demand growth will slow in key markets over 2024-2025, including the U.S. and Europe. The company's sales volume will likely decline slightly in 2024, before resuming growth in 2025.

Revenue and volume growth of CATL and LG EnSol



e--Estimate. Sources: Companies' announcements, S&P Global Ratings.

CATL will gradually expand to Europe from China

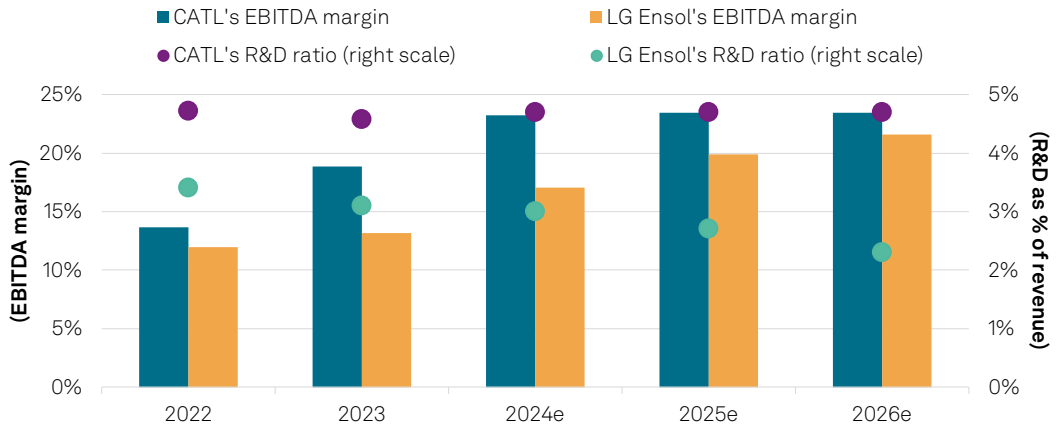
	Estimated production capacity exposure in 2023	
Region / Country	**CATL**	**LG EnSol**
Greater China	98%	40%
Europe	2%	30%~35%
Japan/Korea	N.A.	10%
North America	N.A.	15%~20%
Total production capacity (gigawatt hour)	**552**	**280**

Sources: Companies' announcements, S&P Global Mobility. S&P Global Ratings.

Rating Buffer Trends Are Diverging For CATL And LG EnSol

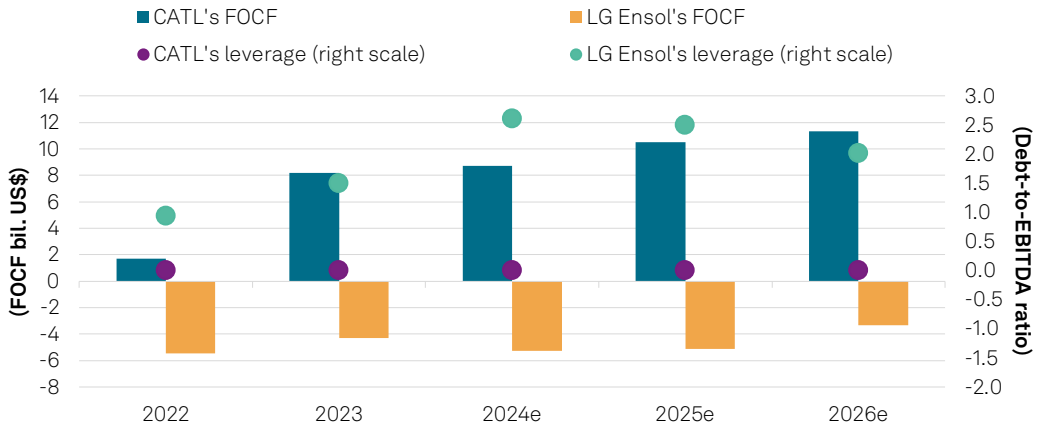
- We anticipate a modest EBITDA margin expansion for CATL over 2024-2026. This is supported by improving economies of scale and the rollout of new products with better margins. For LG EnSol, we forecast its operating margin, excluding AMPC benefits, will come under pressure from lower utilization. The blended margin, including AMPC, could improve, but with some downside risks.
- Higher operating cash flow and slowing capex amid moderating EV growth will expand CATL's FOCF and deepen its net cash position in 2024-2026. The company will also invest more than 4% of annual revenue into technology development.
- We revised the outlook on LG EnSol to negative in May 2024 on expectations that its debt leverage will deteriorate in 2024, and remain elevated in 2025. This is due to slowing demand growth and intensifying competition, amid an ongoing high capex cycle.

LG EnSol's margin could improve on tax incentive in U.S. ...



R&D—Research and development. e--Estimate. Source: S&P Global Ratings.

... But its leverage will elevate on capacity expansion



FOCF—free operating cashflow. e--Estimate. Source: S&P Global Ratings.

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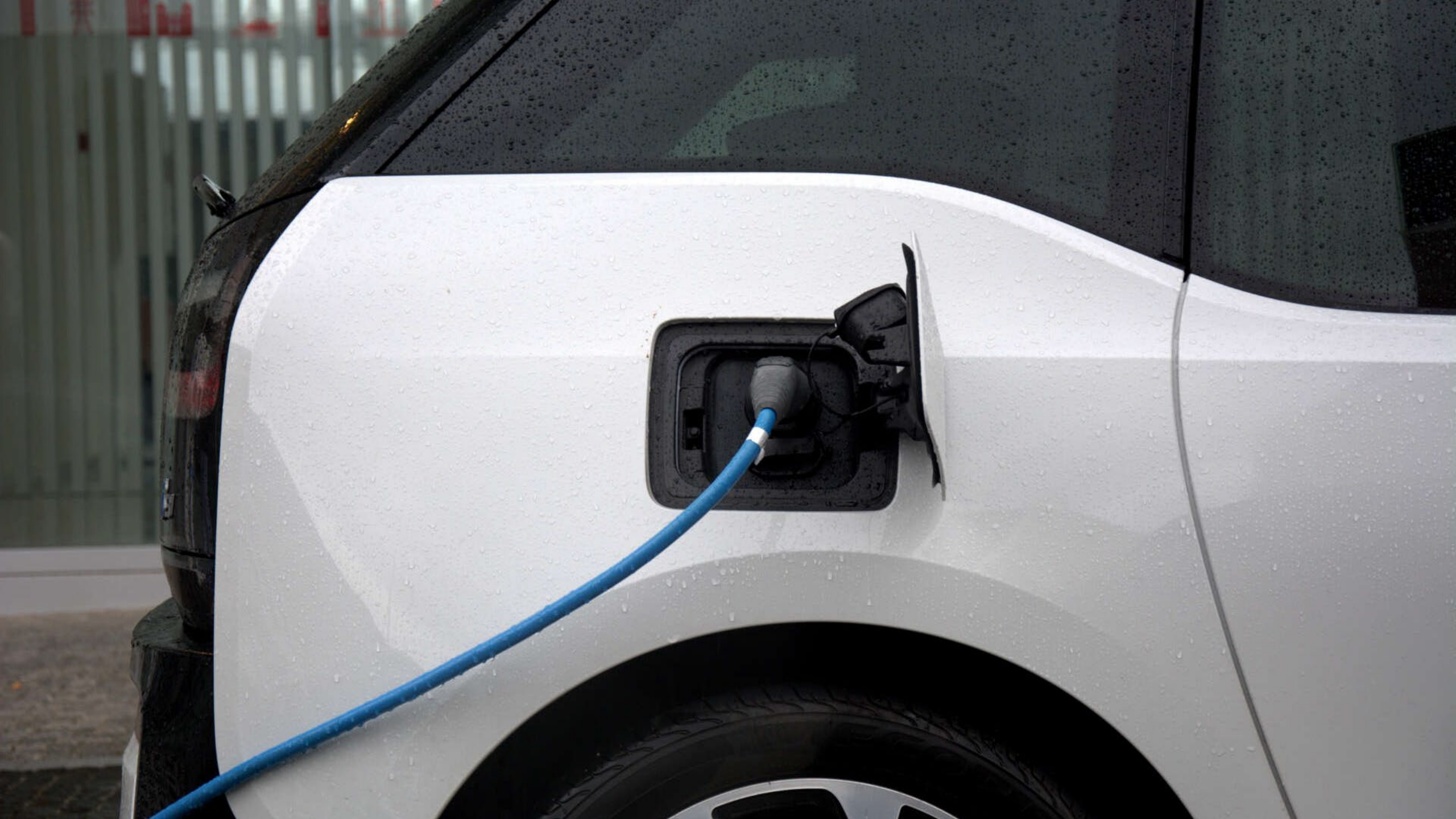
Related Research

Commentary

- Global Auto Outlook: More Players, Less Profit, Oct. 09, 2024
- China ahead in delivering affordable electric mobility, May. 29, 2024
- China EV Startups Struggling To Stay Afloat, May. 28, 2024
- Asian Battery Makers Are Shifting Strategies To Hold Onto Global Lead, Oct 05,2023
- Korea Is On The Brink Of A Battery Boom, Dec. 06, 2022
- Battery Suppliers, Automakers To Take Charge As Prices Rise, May. 18, 2022
- High-Flying Battery Makers Have Much To Win And Lose, Jun. 21, 2021

Research Updates

- Contemporary Amperex Technology Upgraded To 'A-' On Sustained Business Growth, Low Leverage; Outlook Stable, May. 07, 2024
- Research Update: LG Chem, LG Energy Solution Outlook Revised To Negative On Aggressive Expansion Investments; 'BBB+' Ratings Affirmed, May. 28, 2024



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