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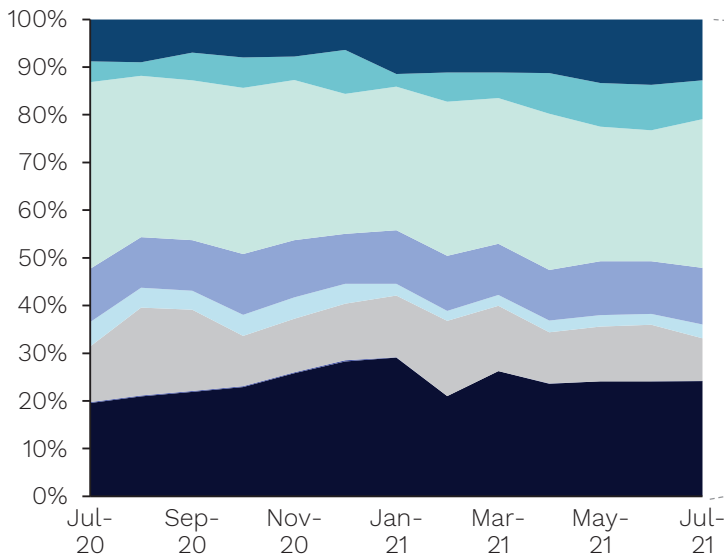
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Report methodology and glossary can be found on the final page

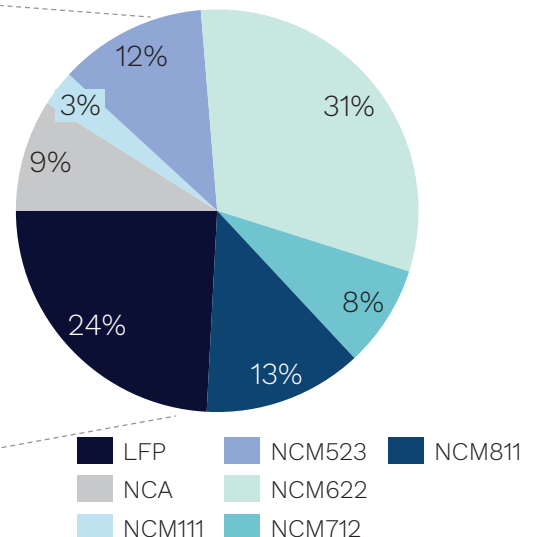
EV Battery Chemistry developments this month

- Talga released the results of a life cycle assessment (LCA) of its lithium ion battery graphite anode product Talnode. Hitachi ABB Power Grids conducted the LCA to assess the environmental impact of the products life cycle from extraction to factory. The results showed production of Talnode emits 96% less greenhouse gas emissions compared to the incumbent synthetic graphite anode produced in China, with a reported saving of 2.9Mt of CO₂ per million EVs produced. Talga plans to produce Talnode from its EV Anode qualification plant in Sweden, as part of its Vittangi Anode Project and is expected to begin anode production from 2023. Talga has a number of European customers including Freyr battery, that it signed a two year anode supply MoU with in June this year.
- Seven British companies have signed a MoU led by the government backed Faraday Institution to work together to develop a solid-state battery. The consortium is made up of BritishVolt, E+R, Johnson Matthey, UK BIC and groups from the University of Warwick and Oxford. Funding for the group is yet to be raised, however designs for a prototype facility have been drawn up. This would allow solid-state battery technology to transition from university labs to scalable manufacturing techniques producing larger cells for EVs.
- Leyden Jar Technologies raised €22 million through a new investment round for the further development of sustainable batteries. In May last year, the company announced its 100% silicon anode that offers a reported 70% higher energy density at 1,350Wh/L, as well as 85% less CO₂ emissions, than conventional lithium ion cells. The additional funds will be used to scale up production capacity and to allow further investment in the technology.

Monthly weighted average EV battery cathode chemistry all vehicle classes

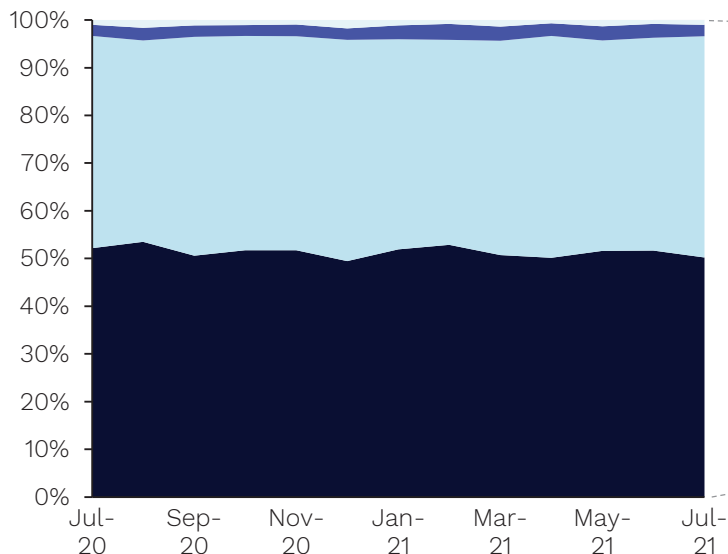


Monthly weighted average EV battery cathode chemistry all vehicle classes

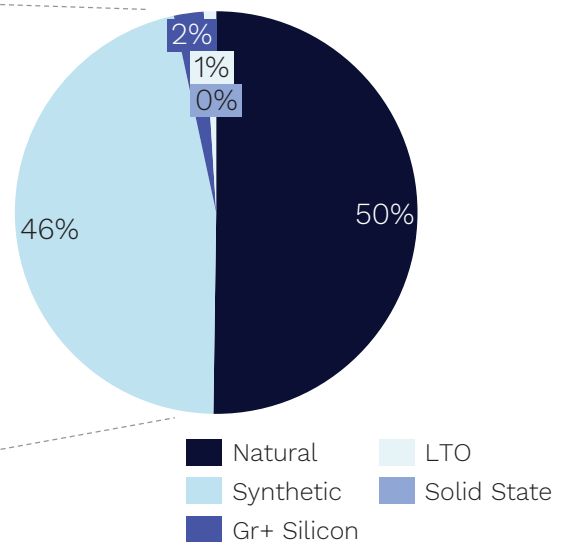


- Following GM’s announcement it would recall all remaining 2019–2022 models of the Chevrolet Bolt, production has been halted at Orion Plant in Michigan. GM will pause production of the Bolt EV, EUV and the battery replacement of recalled vehicles until confidence in battery supplier LG Energy Solutions has been restored. The battery fires are known by LG and GM to be the result of a torn anode tab and a folded separator in the modules, however the scale of the defects are yet to be determined. GM are inspecting LG’s manufacturing processes during the first fortnight of September in the hope vehicle production can resume when batteries are guaranteed to be defect free.
- Renault Group announced a five-year lithium offtake supply agreement with global lithium developer, Vulcan Energy. Renault has set a number of ambitious electrification targets, including 65% of sales electrified in 2025, and 90% of sales BEV in 2030, as well as the goal to offer ‘made in Europe’ vehicles. Through the agreement Renault will purchase between 6,000 and 17,000 tonnes of battery grade lithium chemicals from Vulcan’s combined geothermal energy and lithium resource in Germany, with the start of commercial delivery set for 2026.
- Akasol AG’s Gigafactory 1 entered operation. With an initial capacity of 1GWh, it is now the largest factory for commercial vehicle battery systems in Europe. The Gigafactory is due to expand to 2.5GWh by late 2022, with a further expansion up to 5GWh dependent on customer requirements. Akasol signed a framework agreement in July 2021 to supply its batteries to a ‘major bus and commercial vehicle manufacturer’ from Belgium beginning in Q4 of this year. Gigafactory 2 in the US is also scheduled to enter operation later this year.
- Freyr Battery announced it has signed two MoU’s to scale up battery cell technology and production in Finland. The first, with the Finnish Mineral Group, is for strategic collaboration on the development of industrial scale battery cell technology, and the second, with the City of Vaasa, is for a potential 90-hectare Gigafactory site for cell production in Finland. Freyr plans to develop cell production capacity of up to 43GWh by 2025, and up to 83GWh by 2028. The two partners will enable a short travelled raw material supply chain, with Finnish Mineral Group currently working to develop a local lithium-ion battery value chain.

Monthly weighted average EV battery anode chemistry all vehicle classes



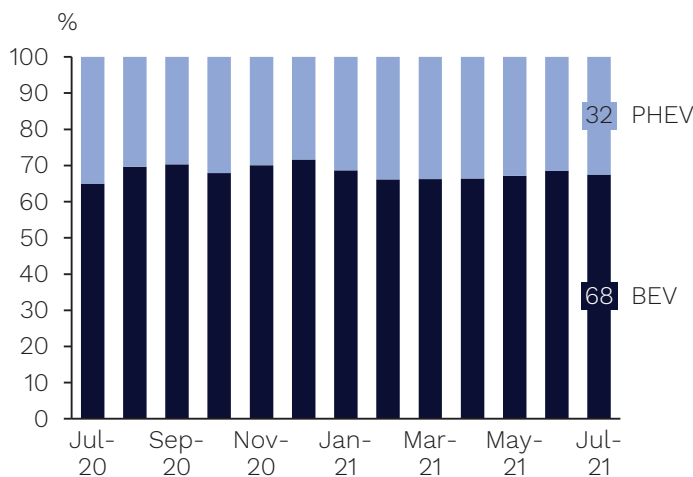
Monthly weighted average EV battery anode chemistry all vehicle classes



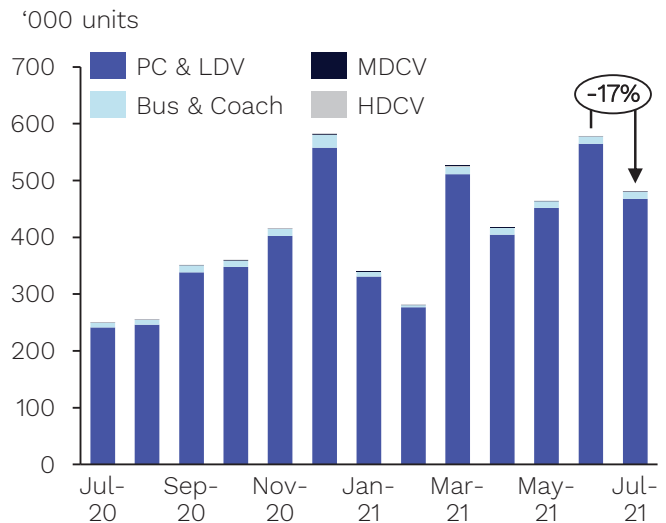
Electric vehicle market developments

- Overall BEV & PHEV sales decreased by 17% m-o-m in July 2021, with 480,000 units sold. In China, PC & LDV sales remained strong at above 230,000 units for the second consecutive month. Meanwhile in the EU & EFTA & UK PC & LDV sales decreased by 34% m-o-m, with 150,000 units sold. European summer holidays are responsible for this significant reduction in sales, with countries including France, Spain and Sweden seeing a m-o-m reduction of more than 50%.
- In Germany, the BMW iX xDrive40 electric SUV was launched with 239 units sold. The standard model with a 77kWh battery pack has a WLTP range of 413km. The more expensive iX xDrive50 has a 112kWh battery pack with a WLTP range of 610km. The iX will reach the wider European market from November, for the xDrive40 and early 2022 for the xDrive50, it is expected to reach the US market later in 2022.
- Also launched in Germany was the Mercedes-Benz EQS, with 23 units sold. The EQS is the first vehicle to use Mercedes' new modular architecture for larger vehicles, called EVA and is fitted with CATL NCM811 95kWh battery.
- ORA EV launched the Cherry Cat, the first EV that carries SVolt's cobalt free NMX battery at Chengdu Motor Show 2021. The Cherry Cat is to be offered with a 79kWh NMX cell with a NEDC range of 600km and SVolt's cheaper 60.5kWh LFP cell with a NEDC range of 470km.

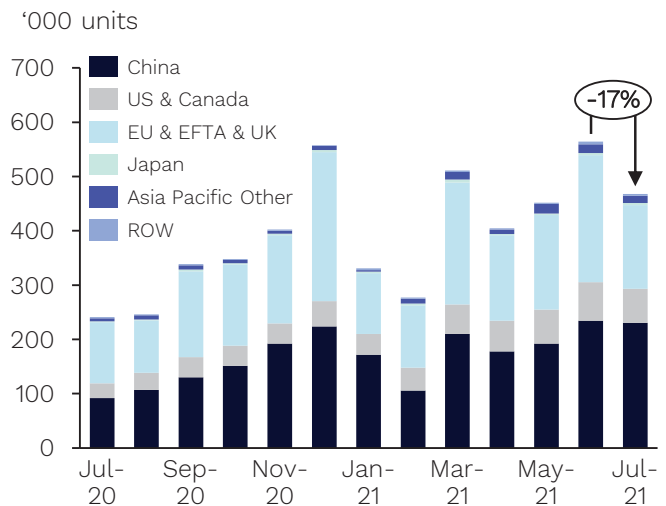
Global PC & LDV BEV/PHEV market share



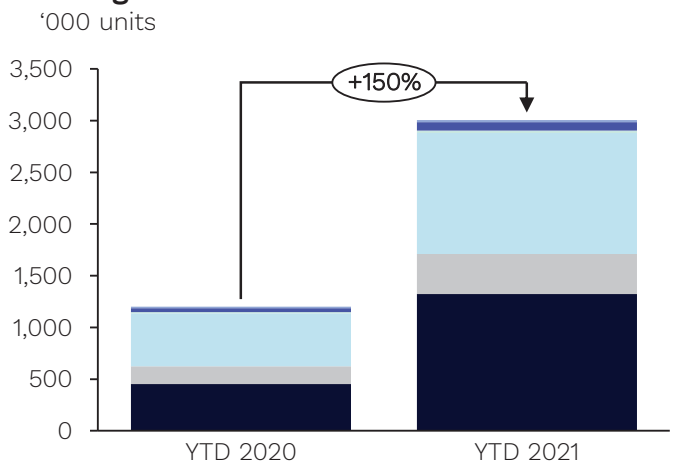
Global Monthly EV sales by vehicle class



Regional Monthly PC & LDV EV sales



Regional Year-to-date PC & LDV EV sales

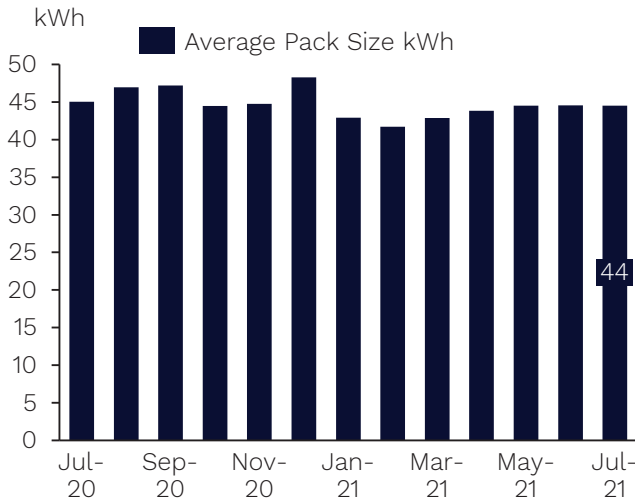




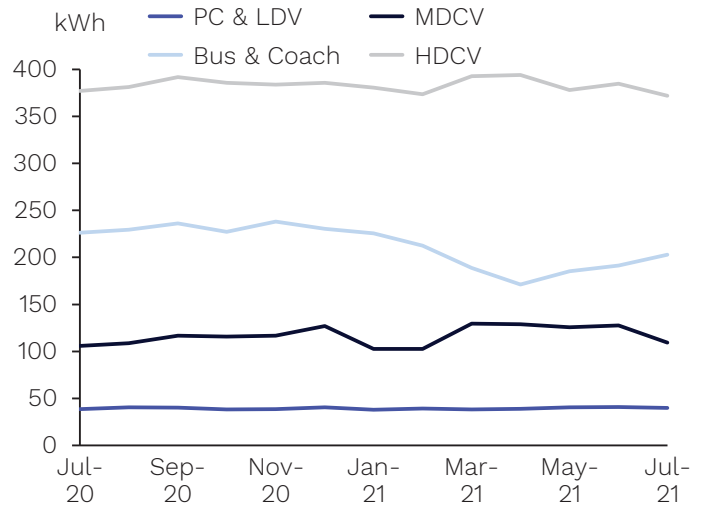
Electric vehicle battery market developments

- The fall in vehicle sales saw global battery demand for all vehicle classes decrease by 17% m-o-m in July 2021 to 21.4GWh. Despite the lower demand this month, it is double the battery demand deployed in July 2020 at 11.3GWh, a sign of how strong the EV market is this year, with July generally having weak sales for the total vehicle market.
- 2021 YTD battery deployment is now 124% above 2020 levels, compared to the increased y-o-y EV sales of 150%, due to the smaller average pack size. The sales weighted average pack size fell slightly to 44kWh in July.

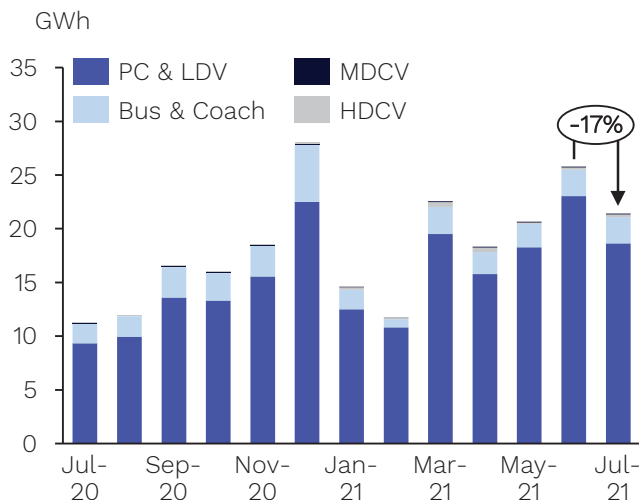
Monthly Sales weighted average EV battery pack sizes all vehicle classes



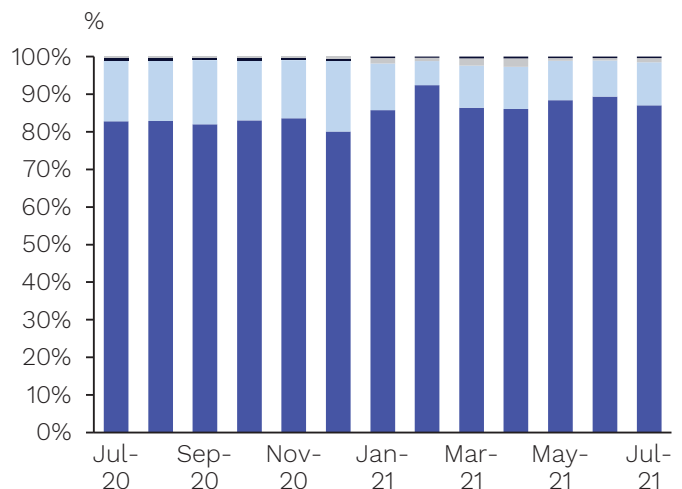
Monthly Sales weighted average EV battery pack sizes by vehicle class



Global Monthly EV battery demand by vehicle class



Monthly sales weighting by vehicle class, % of Wh deployed

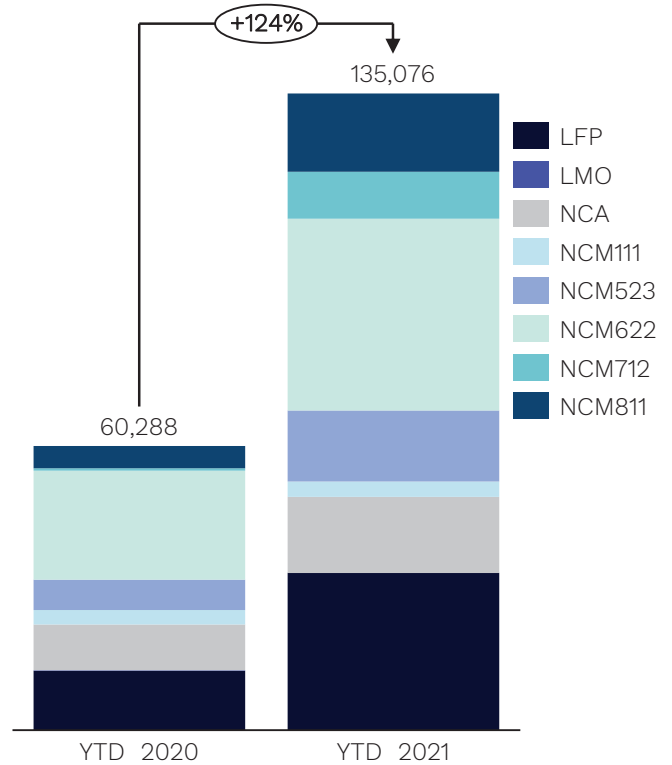




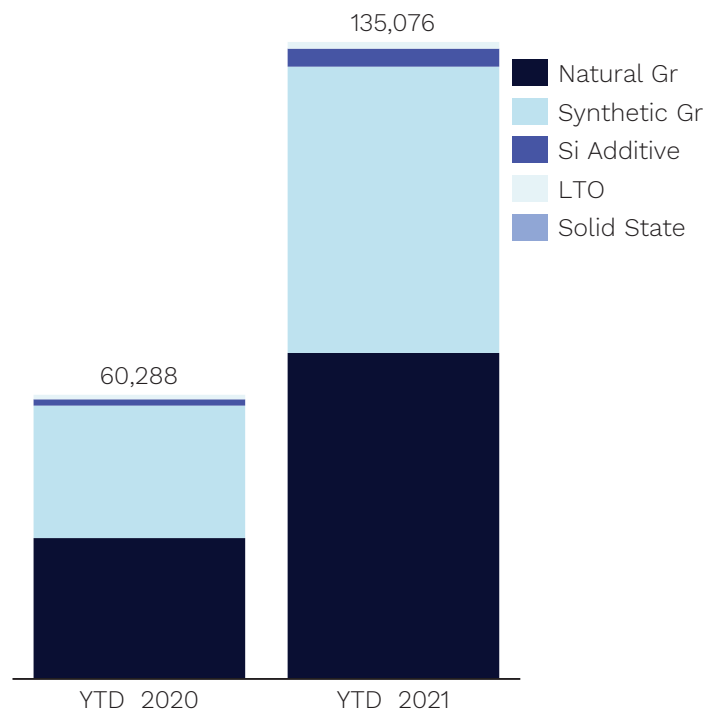
Monthly market share by cathode chemistry

Battery Chemistry	Estimated monthly MWh EV battery demand	Estimated monthly battery chemistry market share
LFP	5,173	24%
LMO	6	>1%
NCA	1,923	9%
NCM111	612	3%
NCM523	2,541	12%
NCM622	6,677	31%
NCM712	1,752	8%
NCM811	2,734	13%
Total	21,416	100%

EV battery deployment by cathode chemistry (all vehicle classes), MWh



EV battery deployment by anode chemistry (all vehicle classes), MWh



Monthly market share by anode chemistry

Battery Chemistry	Estimated monthly MWh EV battery demand	Estimated monthly battery chemistry market share
Natural Graphite	10,756	50%
Synthetic Graphite	9,938	46%
Silicon Additive	512	2%
LTO	210	1%
Solid State	-	0%
Total	21,416	100%



Assessment Methodology

- This assessment provides a weighted average EV battery chemistry by cathode and anode across passenger car and light duty vehicle, bus and coach, and medium and heavy duty vehicle sectors. EV sales data is collected on a model-by-model basis from automotive associations, OEMs and data providers at country level for both BEV and PHEV vehicles for major markets.
- This analysis covers a minimum of 95% of total global market sales, and provides a balanced representation of markets with different vehicle characteristics, suppliers and seasonality. Where EV specific model data is not explicitly stated estimates are used based on industry and company reports and primary research. These are then corroborated or adjusted when official data becomes available.
- For each vehicle model we collect data relating to battery pack size, battery chemistry and cell supplier in addition to a number of other vehicle metrics. This data is collected from a number of both public and private sources, and includes estimates where reliable data is not available.
- The chemistry classifications used in this report are designed to provide representative coverage of the total market, while still being broad enough to facilitate a useful comparative analysis between categories. It should be noted that within categories there is significant variation in the actual chemistry and material mix.
- In addition, different chemistry cathodes are often blended in order to achieve certain performance or cost parameters for a given vehicle.
- On the anode side, the share of natural and synthetic graphite is determined by material intensity covering 100% synthetic, 100% natural and blended synthetic/natural anodes. The classifications used in this report are below, along with subcategories included in each broader grouping. These groupings are open to review as new chemistries become more dominant.

Cathode

- LFP
- LMO
- NCA
- NCM111
- NCM523
- NCM622 (includes NCM613)
- NCM712
- NCM811 (includes NCMA)
- Other (includes LMNO, Lithium Sulphur and other early stage technologies).

Anode

- Graphite, of which:
 - Natural
 - Synthetic
- Silicon additive
- Silicon Dominant
- LTO
- Solid State

Assessment Glossary

Vehicle: EV – Electric Vehicle, BEV – Battery Electric Vehicle, PHEV – Plug-in Hybrid Electric Vehicle, PC – passenger car, LDV – Light Duty Vehicle, MD – Medium Duty, HD – Heavy Duty, CV – Commercial Vehicle.

Battery: LTO - Lithium-titanate, LFP - Lithium iron phosphate, LMNO – Lithium Manganese Nickel Oxide, LMO - Lithium Manganese Oxide, NMC - Lithium Nickel Manganese Cobalt Oxide, NCA - Lithium Nickel Cobalt Aluminium Oxide, LCO - Lithium Cobalt Oxide, NCMA - Nickel Cobalt Manganese Alumina