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Ti Future Mobility: Electric Vehicle Supply Chain Architecture - Market Report

Automotive supply chains will undergo a radical transformation over the next decade as the internal combustion engine is phased out in favour of alternative propulsion systems. Although it is not yet completely certain which type of technology will win the race to replace petrol or diesel engines, it is clear that electric vehicles will play an important, even defining, role in the industry's future.

Ti's Electric Vehicle Supply Chain Architecture report analyses the source of the materials used in this new supply chain; where value is added in the production process; where batteries are manufactured and assembled; and finally, how existing supply chains will be transformed.

This report contains:

- Analysis of the source of materials used in automotive supply chains and where value is added in the production process
- Information on where batteries are manufactured and assembled
- Insight into how existing supply chains will be transformed
- The trends and developments shaping the management of the battery supply chain

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A sneak preview

The market for automotive batteries



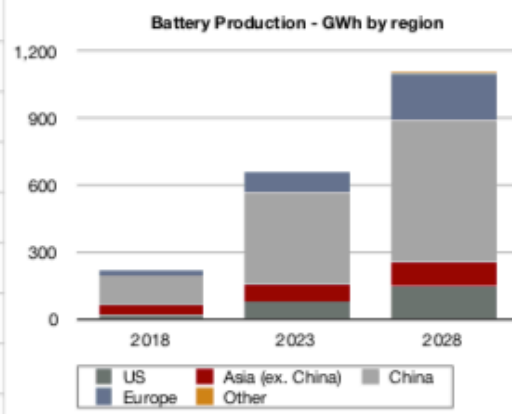
Not only is the market for automotive batteries changing very quickly, it is far from certain that it is entirely a 'market'. Two of the largest providers are from China and are owned by the State and thus have access to low-risk capital. At this early stage this funding is probably critical to their existence as the prospects of this market are unclear, both in terms of demand and in terms of future technology. This appears to have a substantial effect on the market as certain manufacturers, such as the German manufacturer Bosch, decline to enter the market citing poor profitability. Whether this behaviour will continue is uncertain. It appears quite likely that the trajectory of the market will change very significantly, not least as new battery technology is introduced. Therefore, the present competitive position of the various market participants may change.

Essentially the largest manufacturers in terms of volume are producing a commoditised product, whilst many of the smaller producers are manufacturers of new technology.

One of the most important developments has been the establishment of large-scale battery production in China, both by State-owned Enterprises and by other - generally Japanese and Korean - battery companies. This has been a response to Chinese state initiatives to support electric vehicle production.

China has the biggest market for EVs and provision of batteries is dominated by many locally based Chinese battery manufacturers such as Contemporary Amperex Technology Co. Limited (CATL) based in Fujian Province and BYD Co Ltd, part owned by Warren Buffett's Berkshire Hathaway. In addition to these, according to Forbes, there are over 140 battery manufacturers in China competing for a slice of a projected \$240 billion market in the next twenty years. Battery cell production capacity is forecast to reach 250GWh by 2020, and between 2020 and 2037, it is expected to grow by a multiple of 10 to keep up with demand.

Battery production per country (2017)	
Country	GWh production capacity
China	217.2
United States	46.9
South Korea	23.1
Japan	14.0
Poland	5.0
Hungary	1.7
United Kingdom	1.4
France	1.1
Czech Republic	1.0
Russia	1.0
Germany	0.7
Finland	0.1



Source: Visual Capitalist/Benchmark Mineral Intelligence

Leading battery manufacturers



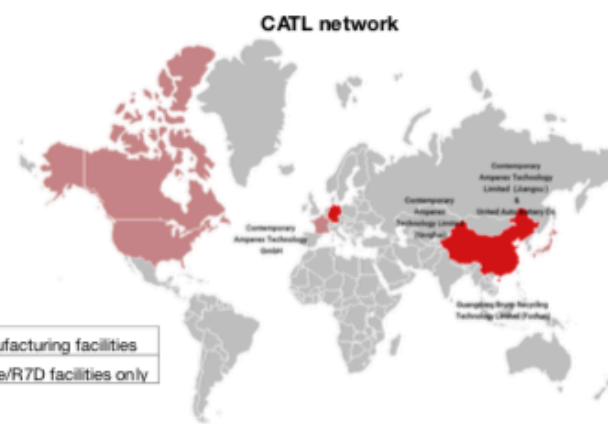
Contemporary Amperex Technology Co. Limited (CATL)

Contemporary Amperex Technology is believed to be a Chinese 'State Owned Enterprise' or at least a company with State support. It is said to be one of the largest Li-ion automotive battery producers in the world, however it is unclear if this reflects planned, rather than existing production capacity. CATL have stated that in the near future they will have a total production capacity of 41.5 gigawatt hours.

CATL's most high-profile relationship has been that with BMW. It has supplied BMW and its joint venture partners in China with Li-ion batteries for several years and the two have announced a deal by which CATL will build a battery cell plant in Germany to supply BMW operations in Germany. It appears that this deal is exclusive.

CATL plans to ramp up output in Germany where a lack of local producers has left automakers dependent on Asian suppliers for batteries. CATL is building a €240m lithium-ion battery factory near Erfurt, eastern Germany, expected to begin production in 2021 with an initial capacity of 14 gigawatt hours per year. The company recently indicated that capacity will be expanded to 60 GWh by 2026, and that demand in Germany could reach 100 GWh even sooner.

Among the customers CATL plans to supply from Erfurt are BMW, Daimler and Paris-headquartered PSA. Although CATL cooperates with Volkswagen in China, Volkswagen procures its batteries for Europe from LG Chem, Samsung and SK Innovation.



Planned investments

- Huxi, China
 - Planned expenditure of \$1.3bn
 - Battery output: 24 GWh annually

- Erfurt, Germany
 - CATL plans to invest \$240m in the first phase of building its first site in Europe to supply lithium-ion batteries to BMW
 - Output should reach 14GWh annually by 2022

“Fundamentally there is a shift in the nature of components used, from mechanical engineering to electrical and electronic engineering. The economics of both designing and producing these components is very different. This has enormous implications for how the automotive supply chain is ordered.” Thomas Cullen, Ti

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