

## Feature Report Electric Vehicle

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Industry Research

### China EV – Revisited in SEPT Framework

#### China EV Market Recovering Strongly After COVID-19 Pandemic

After a dismal 1Q under COVID-19 lock down, China EV market returned to strong QoQ growth in 2Q driven by Tesla's ramp up of its domestic production in Gigafactory 3. In just a few short months, Tesla surpasses BYD as the top player in the China market.

#### NIO Leading the Pack Among Pure Plays

Among the pure plays, NIO is taking a distant lead into July, followed by Li Auto, Weltmeister, XPeng, Leap Motor. To further strengthen its position in EV infrastructure, NIO launched the Battery as a Service (BaaS) to new EV buyers to decouple the cost of battery from that of the vehicle body. NIO also offers battery switching services in addition to super charging station and has built 143 such battery pack switching station in China with target to operate 1,100.

#### Evergrande New Energy Vehicle Eyeing 1mn Hengchi

In 12 months, ENEV Hengchi will launch its EVs, hundreds of thousands at first, in the domestic and international markets. It is hard to tell if the China and international markets can grow fast enough to accommodate this additional million-a-year capacity, and we are on the pessimistic side that it cannot and expect to see more EV makers to fail to exist as stand-alone entities, or fail to exist altogether.

#### Long Mileage Segment Deploying LFP Chemistry Not in View

No development is seen in the key area to develop in the long mileage segment deploying LFP chemistry. We may be wrong, yet the logic is simple and reiterated: China EV players have seen the dead end on short mileage range, the inherent deficiency of LFP chemistry, and they should have visualized the potentials in combining the cheaper manufacturing costs of LFP chemistry and long mileage range EV. If Tesla succeeds in this segment before China EV makers do, what is left to China EV makers will be nothing. And we added ENEV Hengchi as well.

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SEPT 8, 2020	Closing Prices	Mkt Cap (US\$ bn)
TSLA US Tesla Inc. 特斯拉	US\$330.21	US\$307.7
NIO US NIO Inc. 蔚来汽车	US\$17.03	US\$23.2
XPEV US XPeng Inc. 小鹏汽车	US\$17.73	US\$13.0
LI US Li Auto Inc. 理想汽车	US\$15.79	US\$13.2
1211 HK BYD Company 比亞迪股份	HK\$82.50	US\$33.6

## Overview

China's Electric Vehicle (EV) market plummeted in the first half of 2020 amid COVID-19 pandemic. Sales in first quarter fell by 40% YoY and there are signs of recovery in the second quarter with QoQ sales more than doubled, despite still down 25% YoY on strong sales in the first half of 2019 before the reduction in government subsidy become effective in June 2019. EV market is a bit worse than the overall market. In the first six months of 2020, Chinese factories shipped 7.61mn million passenger cars, which is 23.4% fewer YoY.

Tesla is the driver behind such strong growth. It is making a strong debut of its domestic production with Gigafactory 3 capacity coming on stream. In just a few short months, Tesla surpasses BYD as the top player in the China market. Tesla CEO Elon Musk officiated the delivery of first batch of Model 3 rolling out from production line to car owners in a media fanfare.

**Exhibit 1: Tesla CEO Elon Musk Posting with Owners of Gigafactory 3 Roll Out**



Source: [bloomberg.com](https://www.bloomberg.com)

**Exhibit 2: New Energy Passenger Vehicle by Makers in New Insurance 1H2020**

Source: [evpartner.com](http://evpartner.com)

### Domestic Pure Plays Shine and Advance in Sales Ranking Rapidly

The good sign for domestic EV players is that some pure plays are delivering and advancing in sales ranking rapidly. Their sales momentum continues into July and despite they are no match to Tesla in shipment, some of their product lines are coming closer and the brand image, which is the cutting edge for Tesla to storm the market, is becoming more aware by EV buyers. Yet the gap is huge. In term of unit shipment, Tesla delivers 45,754 Model 3, versus 45,795 units in aggregate by top 10 domestic pure plays of all models in the first six months of 2020.

For BYD, the new Qin EV is doing well with over 20k unit shipment. Yet its most affordable Yuan EV is not selling well, with unit sales down 80% YoY, despite selling at post-subsidy prices of RMB89,900, its 42 kWh battery pack at 305km range is not helping.

**Exhibit 3: Domestic Pure Plays with Sales Momentum Continues into July**

Source: [evpartner.com](http://evpartner.com)

Among the pure plays, NIO is taking a distant lead into July, followed by Li Auto, Weltmeister, XPeng, Leap Motor, in order.

NIO is moving in strong momentum with its EC6 SUV coupe scheduled to launch by September and help fill its product line up on the high end and enhance its brand image. This is in contrast to some players that focus on a single model.

The flip side of tighter government subsidy scheme in the pandemic environment is that some EV makers fail in the fight for survival and we see closure of factories, stop payment of wages to workers, and rumour of key management fleeing.

### China Evergrande New Energy Vehicle Hengchi Series Campaign

Yet the most eye-catching event to be expected will definitely be the Hengchi series of EV from China Evergrande New Energy Vehicle (ENEV). In a high-profile televised advertising campaign that last for just over a week, Evergrande bombarded audience with its forceful brand building advertisements. Though the models are numbered simply from 1 to 6, Hengchi 1 to Hengchi 6, with mass roll out to start in late 2021, the product offerings are wide and include various body styles from sedans to SUVs and

even a seven-seater van. A quick check on ENEV's factory building schedule is that it roughly matches that of Tesla's Gigafactory 3 in Shanghai.

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#### Exhibit 4: Evergrande New Energy Vehicle Hengchi 1-6 Product Line Up



Source: *electrive.com*

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ENEV is keen to develop the EV business and highlights multiple line cashflow forecasts into 2023 for this million-cars-a-year segment in its results presentation. This should definitely be a game changer in the China market and beyond, and crash head-on with Tesla domestically and internationally. How the smaller pure plays fare under the weight of this giant will be interesting to follow and they have 12 months or so to response in full.

#### **Hengchi: Where is it Heading**

While Hengchi is offering six models in media campaign, few technical details and product specifications are available yet. Eyeing for 1mn shipment per annum will definitely on a collision course with current leader Tesla. Without a strong brand name and supporting infrastructure, this can be a challenging task. ENEV still have 12 months or so for more advertising and groundworks laying, which can help with lavish budget. Yet the product portfolio and strategic direction should have been fixed now, at least in the mind of top management and product development team.

Of particular interest to us is ENEV's direction in long mileage segment, especially in deploying LFP chemistry. As state in our last report, Tesla has indicated its intention in this direction, and this may be a point for Hengchi to break out.

A quick review of Tesla's product launch schedule will show thoughtfulness in super luxury and style for brand building, luxury car for words of mouth, affordable car for volume and profitability. Really SEXY.

What is next? It may be the Tesla Advanced Long-range LFP Sedan, TALLS.

**Before Asking Where is the Money, Ask Where is the Battery**

With ambitious business plan in this new business segment, ENEV and its parent company China Evergrande are keen to diversify away from property development. With 12 months away from its first product roll out, we just see a modest product Hengchi 1, without any details on technical specifications and a peek into supply chain. Tesla is known to make its battery under its own roof and self-sufficient. ENEV says nothing in this key link in the supply chain. Thought battery makers around the world are expanding capacity, yet to fulfil 1mn EV is another matter. The easiest way is to reap batteries from incumbents. Interesting to follow.

**Fragmented EV Charging Infrastructure**

While ENEV Hengchi is putting its vehicle as top priority in advertising campaign, incumbents are rushing to build infrastructure, specifically charging stations and quick charging poles, and even switching battery pack amid fragmented EV charging infrastructure.

Currently, the EV charging sector in China is divided into three main groups: state-owned companies like State Grid and China Southern Power Grid; battery makers like TELD and Star Charge; and EV manufacturers like XPeng Motors and Tesla that are constructing their own charging stations. While the varied playing field encourages competition, standards and payment systems have yet to be unified, making an integrated nationwide system of chargers difficult to implement. Tesla, the undisputed leader in EVs, realized this at an early stage and has been building its own charger network across China since 2015. NIO is making great effort to unified the market with apps to break the barriers and allow cross model charging.

**Pure Plays Going for IPOs**

There are good news to pure plays. XPeng and Li Auto are listed on the U.S. stock markets and raised billions of US Dollars with strong investor interests. Market news are around that others domestic pure plays are eyeing SSE STAR Market. Tesla also plans to raise up to US\$5bn by selling shares lately.

## Quick Fitting into the SEPT Framework

Quite some topics have been covered in the overview section above and here we will highlight these under the SEPT framework. More will be covered in the technology section as there are major technology development directions in the EV arena.

## Social Aspect of SEPT Framework

As part of the infrastructure building efforts to enhance EV driver experiences, NIO and other EV makers are actively considering switching battery pack in the vehicle compartment and there is a major development lately. For switching to be possible, it must be started from vehicle body design with access to unload and reload the battery pack. NIO is a front runner in this area.

NIO has built 143 such battery pack switching station in China with target to operate 1,100. Currently, NIO vehicle owners can buy new battery pack from NIO and have the switching services done in these stations. This may help frequent long mileage drivers who see fast battery ageing and shorten mileage range. Yet the high cost of battery pack in comparison with a new EV makes the switching not an attractive alternative. Yet the new battery rental services offered by NIO can make it a real option.

### NIO to Launch the Battery as a Service

In August, NIO launched the Battery as a Service (BaaS) to new EV buyers to decouple the cost of battery from that of the vehicle body. NIO customers can choose to buy the EV body without the battery pack for a saving of RMB70k at time of purchase, and pay RMB980 each month to rent the battery from a company formed by NIO and others that finance the initial RMB70k cost of battery pack. NIO customers can also have the option for future battery upgrade as well. This works fine for heavy duty EV drivers who see battery ageing fast and, accordingly mileage range fell quickly after two or three years. Also, if technological advancement help fit more kWh capacity into the same chassis, existing EV owners can extend the mileage range with ease.

### NIO to Launch EC6 SUV coupe

NIO is going to launch higher end model to complement its product offerings. Yet quite some others are still contented with status quo. It may not be necessary for all EV players to offer a full product line up to cover all segments, but with reference to fossil fuel counterparts, too narrow the product offerings may not be good for the enterprise in the medium term.

Even for those EV players that focus in a single product or single segment, brand building is still necessary in our view. More importantly, they have to excel and hold a strong position in their sole niche segment as it is a matter of make or break for them.

Of course, there is a good alternate route as in every burgeoning industry, that is sell oneself to other players for consolidation. Yet this is on the assumption that one is strong in one key area, be it technology, brand, sales network, etc, but we do not see such in the China market yet.

## **Economics Aspect of SEPT Framework**

Regarding economical sustainability, NIO is again the front runner in this aspect, both for itself and value proposition for its customers. It has made great progress in shipment in 2020Q2 and reported a positive vehicle margin, which is defined by NIO as the margin of vehicle sales, calculated based on revenues and cost of sales derived from vehicle sales only. Very technical.

NIO's Battery as a Service does offer those heavy-duty drivers an option to fit their needs in view of the ageing battery issue. Let's see how it goes and if the RMB980 monthly fee available to all or it is higher to more demanding drivers. RMB11,760 rental for a year versus RMB70k lower initial price translated to 16.8% yield or 6-year payback period.

Whether other EV makers will follow suite is an interesting question, especially those selling to car rental and taxi market. The rental scheme can help such buyers to lower their capital costs.

## **Politics Aspect of SEPT Framework**

Despite China government had significantly reduced subsidy and raised the bar for entitlement, it has stopped further tightening though there is no loosening as well.

As a supporting to the EV industry in standardization issue, China government is issuing electric vehicle power battery pack switching safety standard. Yet in practice the electrical characteristics are often optimized for each EV maker's unique power performance design and such standardization may not be able to see applications to the tens of EV makers soon.

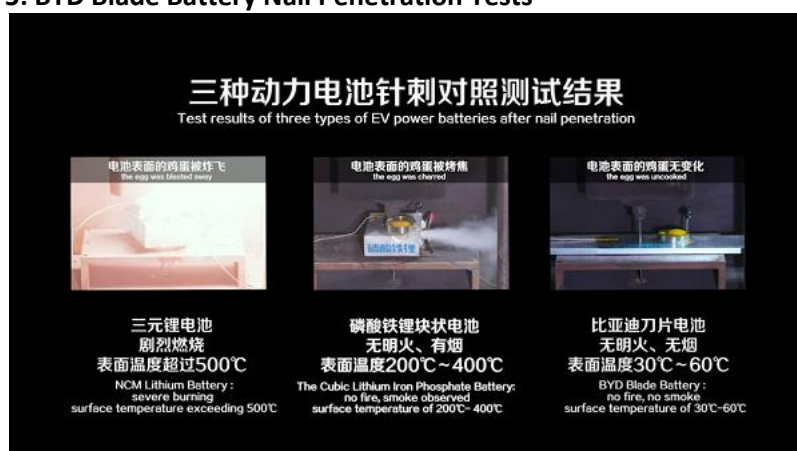


Another key development in government policy is the implementation of scrapped motor vehicles recycling rules on five key parts including the engines, gearboxes, steering mechanisms, bridges, and vehicle frames. Despite this rule applies to all scraped vehicles, its application is of particular relevancy to EV. We have seen the EV graveyard in Jiaying, Zhejiang, which housed 4,000 EVs previously deployed in the car sharing market, according to previous news reports. On top of these are handicapped EVs still on the road with degraded batteries and shortened mileage range. The new rule may help in recovering useful parts such as the motors and steering mechanisms, and picking the less degraded battery cells for refurbishment. With honest and proper product labellings, such refurbished parts or even “new” EVs may have its own clientele.

## Technology Aspect of SEPT Framework

There is one notable development in the technological field. BYD announced key development in its blade battery in March. It boasted that the new battery cells have better thermal stability and stronger resistance to collisions. The product has passed nail penetration tests, a type of safety testing done to stimulate internal short-circuiting.

### Exhibit 5: BYD Blade Battery Nail Penetration Tests



Source: [byd.com](http://byd.com)

BYD also announced that space utilization of the battery pack can be increased by over 50% compared to conventional lithium iron phosphate (LFP) block batteries and singular cells are arranged together in an array and then inserted into a battery pack.

Other news comments come with more details. By changing conventional prismatic LFP cells into long thin form factor, BDY can make them to become structural parts of the pack that simplifies the pack design, and

increase space efficiency by skipping the module and enable higher energy density in the same limited space.

Yet such blade battery is not an innovation in electrode materials or technology, it is just an improvement in battery manufacturing process. It can be made to 2m in length with thickness of only 13.5mm.

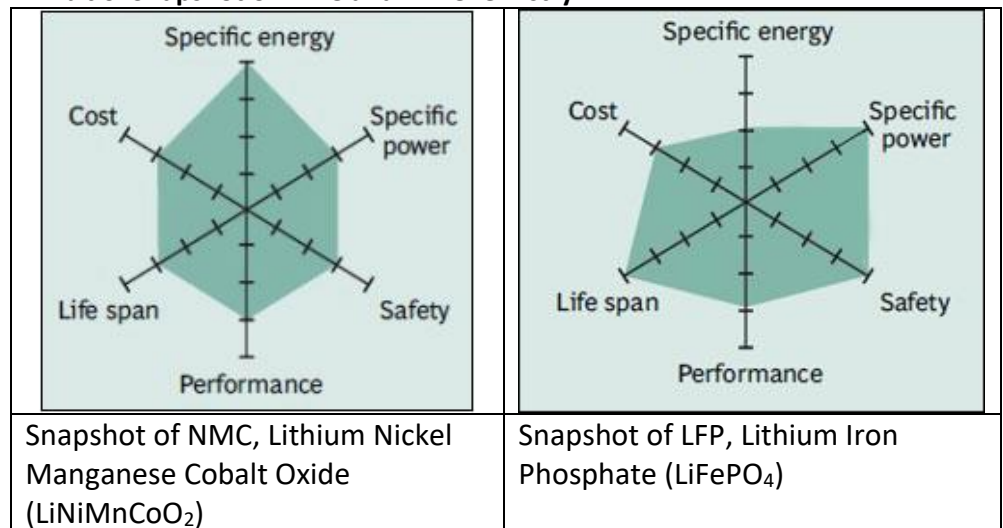
**Space Utilization Improvement to Odd Space or Entire Trunk**

After scrutinizing BYD’s statement, the 50% improvement refers to space utilization, not energy density measure in kWh/kg or kWh/litre which are the key metrics for battery chemistry. We have yet to see implementation to see if that 50% space utilization improvement applies only to the odd space at edges or the entire trunk of battery pack.

While we see BYD’s nail penetration test did prove BYD’s credential and a key technology development, we look forward to see the full picture to assess such technology development’s business potential.

A quick refresh of the LFP chemistry versus NMC, and LFP excels in safety at the expenses of specific energy, that is kWh/kg and kWh/litre.

**Exhibit 6: Snapshot of NMC and LFP Chemistry**



Source: [batteryuniversity.com](http://batteryuniversity.com)

**Toshiba’s SCiB LTO Battery Survive Nail Penetration Test Long Ago**

As background information, we have seen that Toshiba’s SCiB LTO battery survives nail penetration test without catching fire about 10 years ago, yet it is not seeing major EV applications. There are of course inherent deficiencies in LTO technology and one of which is its low voltage that limited its energy density in kWh/kg and kWh/litre.

In practice, few EV self-ignitions are caused by visible penetration in battery cell. Most of such fires occur during charging and few occur while the EV is

idle in parking lot. While such self-ignition news are abundant, detailed reports documenting the circumstances such as battery ageing, fullness of battery charging status, battery temperature, current density, and other technical details, are not readily available for analysis purpose.

### **Design, Sensors, and Control Circuits Key to Prevent Fires**

Some battery fires are known to be caused by poor designs that demand too tight manufacture tolerance. The most famous case is Samsung Note 7 incident. The battery chemistry is fine, yet the design demands exact precision that cannot be implemented in factory floor. Oops.

The most common reasons for fires are believed to be over charging the cells or charging with large current above safety threshold. It is a bit technical to explain in full here and there are solutions to these by incorporating sensors and control circuits to monitor battery cell temperature, charging current, status of ageing, etc, into battery modules and regulate charging current and cooling the cell to below threshold temperature. Safety comes over fast charging in priority.

We are keen to see the performance BYD Han EV equipped with blade battery technology for an NEDC range of up to 605 km. BYD has secured over 30k units in order so far.

## Conclusion: Survival of the Fittest

Having endure the COVID-19 pandemic and seeing some players failing the survival game, China EV makers are still facing tough time ahead, getting trapped between the imminent pressure of Tesla and the looming ENEV Hengchi in 12 months or so.

Consolidations among EV makers are inevitable in a market with too many financially weak players. With completed and coming IPOs for some pure plays with beefed up war chest, those still in R&D and concept phases will be the prey. Yet it is unfortunate that there are lots of me too that lack any selling points in technology, market niche, etc. More will fail, sooner if not later, in our view.

We have seen NIO making progress in enhancing its product portfolio in the high end and building infrastructures such as battery pack switching stations and offering financing option via Battery as a Service. Other EV players are still quiet and it is interesting to see how long they can stay dead quiet.

In 12 months, ENEV Hengchi will launch its EVs, hundreds of thousands at first, in the domestic and international markets. It is hard to tell if the China and international markets can grow fast enough to accommodate this additional million-a-year capacity, and we are on the pessimistic side that it cannot and expect to see more EV makers to fail to exist as stand-alone entities, or fail to exist altogether.

In the key area for China EV makers to develop and defend to last stand in the long mileage segment deploying LFP chemistry, it is unfortunate that we can see nothing in advancement in this area. We may be wrong, yet the logic is simple and reiterated: they have seen the dead end on short mileage range, the inherent deficiency of LFP chemistry, and they should have visualized the potentials in combining the cheaper manufacturing costs of LFP chemistry and long mileage range EV. If Tesla succeeds in this segment before China EV makers do, what is left to China EV makers will be nothing. And we added ENEV Hengchi as well.

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