

Competitive Analysis of New Energy Vehicle Market in China

By

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ABSTRACT

After a decade of continuous policy support and market development, China has the largest number of new energy vehicles (NEVs) in the world and over one million NEVs annual sales. Last year, the Chinese government set an ambitious goal that 20% of all passenger cars sold in 2025 would be NEV. Who are the leading players in this vast market? What vehicles are they selling? What are their competitive strategies? What are the trends? What can automakers do? The purpose of this paper is to study the NEV market in China and answer these questions.

The study analyzes the policies, the infrastructures, the sales data, and the companies. Through analysis of five key companies and other major manufacturers, the thesis categorizes the market segments, identifies some trends, and brings forward some recommendations for automakers.

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1. Policies of NEV market in China

1.1 Financial Subsidies and Tax Incentives

The definition of New Energy Vehicle (NEV) in China includes battery electric vehicle (BEV), plug-in hybrid electric vehicle (PHEV), and fuel cell vehicle. The Chinese government puts NEV as a national priority, because of the energy shortage concern and environmental pollution issue with the tens of millions of traditional combustion engine vehicle sales every year, and the opportunities associated with NEV to upgrade the domestic automobile industry.

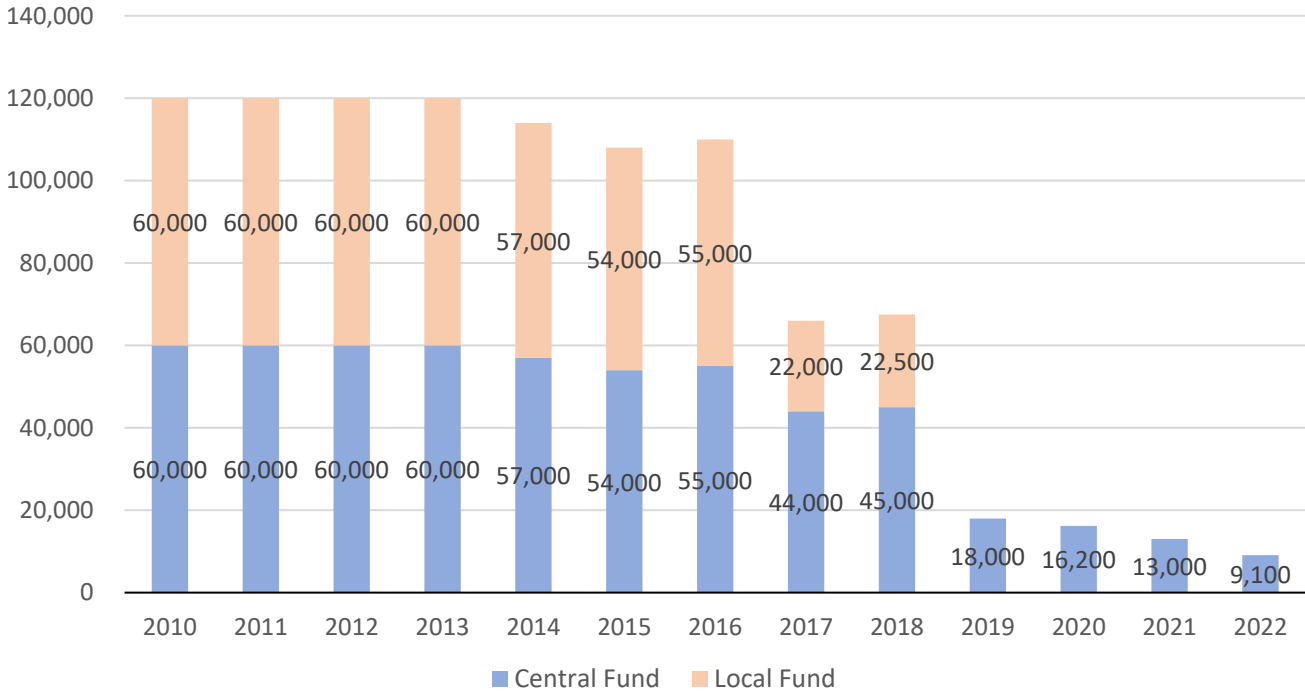
In the aftermath of the Global Financial Crisis, in 2009, the State Council of China introduced the *Auto Industry Adjustment and Revitalization Plan*, which mentioned the strategy for new energy vehicles for the first time. The plan called for the industrialization of BEVs, PHEVs, and their key parts and components. The plan also launched the NEV pilot project with funds subsidizing the usage of NEV in large and medium-sized cities, starting in public service usage.

Then in 2010, the government expanded policies to subsidize private purchases of NEVs. The fund would be received by vehicle manufacturers based on the sales volume to reduce the retail prices of NEVs. The central government would support a maximum of 60,000 yuan per vehicle, and local governments were encouraged to match the fund. As a result, a 250 km-range battery BEV can receive 120,000 yuan in subsidy, which can roughly cover the lithium battery cost.

The subsidies have a set of technical standards to meet. For example, a BEV needed to have a mileage of 80 km, and a PHEV needed to have a pure electric range of 50 km to be fund eligible

in 2013. Over the years, the standards are advancing in range, battery energy density, and efficiency requirements to guide product development. Besides, to gradually wane off the NEV industry that relies on subsidies, the central government’s fund per car is decreasing every year. The local government’s fund was capped at 50% in 2017 and eliminated in 2019. In 2021, the minimum range requirement is 300 km, and the corresponding subsidy is 13,000 yuan. A figure of the subsidy amount per vehicle every year is shown in Exhibit 1. There was a steep decrease in subsidy funds in 2019. The entire subsidies program for NEVs is scheduled to end in 2022.

Exhibit 1: Subsidies for 300 km-range EVs (CNY)



A NEV model needs to be in the government’s *New Energy Vehicle Promotion Recommended Model Catalog* to be qualified for a subsidy. To promote or protect the automobile lithium battery industry, the Ministry of Industry and Information Technology published the *Automotive Power*

Battery Industry Specifications and corresponding qualified battery manufacturers lists between 2015 and 2016. The lists, however, consist of only domestic battery companies. It is believed that only by sourcing from the battery lists, can a NEV model be added to the promotion list and receive the subsidy, barring international automakers from introducing NEV models that use foreign batteries to the Chinese market. The battery specifications and lists are annulled in 2019.

Besides the subsidies, the government also introduced various tax incentives. The NEV subsidy income for manufacturers is not subject to value-added tax, and electric cars are excluded from the consumption tax, which is based on engine displacement. Since September 2014, consumers buying NEVs are exempt from the vehicle purchase tax, which is 10% of the retail price. The purchase tax exemption is extended to the end of 2022. The annual vehicle tax for NEV has also been exempted since 2015.

The combined effect of financial subsidies and tax incentives is a major driving force for NEVs to compete with conventional cars.

1.2 Road Right and Registration for NEV

Some municipal governments have traffic restrictions during peak hours, under heavy air pollution days, or even regularly. The restrictions are typically implemented based on the license plate number. For example, cars with license plates ending with odd or even numbers are categorized into two groups and have road rights on every other day. Electric cars are often not subject to traffic restrictions and have the right to drive every day.

Besides traffic restrictions, several large cities have quotas for new vehicles every year. Cars with license plates from other cities are restricted in local traffic, forcing people to compete for scarce local license plate resources. The pool of license plate resources is divided into licenses for conventional vehicles and licenses for electric cars. The license plate distribution often pivots favorably towards NEVs.

In Beijing, the capital of China, license plates are distributed through lotteries. The annual quota of passenger cars is 100,000 in 2021, including 40,000 conventional vehicle plates and 60,000 new energy vehicle plates. 24,000 new energy vehicle plates are reserved for families without cars. In Shanghai, the most populous city in China, conventional car license plates are distributed through limited-price auctions, priced at around 90,000 yuan in 2020, whereas new energy vehicle license plates are free. In Guangzhou, conventional car license plates are distributed through auctions and lotteries, but new energy vehicle license plates are free. According to insurance data, about 62% of NEVs sold in 2019 are in areas with license plate restrictions.

1.3 Corporate Average Fuel Consumption and NEV Credit Regulation

The CAFC and NEV credit policy, dubbed as dual credit policy, is what the government has planned to promote NEV usage when the subsidies fade. The dual credit policy was introduced in 2017 and amended several times to put pressure on car manufacturers.

The CAFC credit target is set based on the mixture of models that the company sold, and the NEV credit target is set based on the volume of conventional vehicles. The CAFC credit is generated

when the fleet average fuel consumption of a company is lower than the target, and the CAFC credit is only allowed to transfer among affiliate companies. The NEV credit is generated when the number of NEV produced is higher than the target and can be traded between different companies.

The dual credit accounts are calculated every year. When a company fails to meet the CAFC target and ends up with a negative CAFC credit account, the company can cancel the negative account through using positive NEV credits or CAFC credits from affiliated enterprises or through buying NEV credits from others. For example, Reuters reported in 2021 that FAW-Volkswagen, a joint venture, bought NEV credits at around 3,000 yuan per credit from Tesla. When a company fails to produce enough NEVs, the company must buy NEV credit to cancel out the negative NEV account. If the negative CAFC account or NEV credit account is not canceled out within 90 days, companies are not allowed to sell or produce new combustion engine cars.

In short, the dual credit policy requires a company to meet both the fleet fuel efficiency target and the NEV production target.

2. NEV Charging Infrastructure

2.1 Charging Standard

The EV charging standard GB/T 20234-2015 was implemented in 2016. It is an updated version of the 2011 old standard. Though the new standard is recommended, not mandatory, most car manufacturers comply with it. The standard defines both AC and DC charging couplers.

The standard ensures the interconnection between vehicles and charging facilities, prevents the disorderly development of the market, and enhances the confidence of consumers in purchasing and using EVs.

2.2 Public Charging Infrastructure

The central government and local government have implemented incentive policies for the construction and operation of charging infrastructure. According to China Charging Infrastructure Promotion Alliance, by the end of February 2021, there were 837,000 public charging piles in China, up 57.6 % from last year, including 488,000 AC charging piles, 349,000 DC charging piles, and 481 AC-DC integrated charging piles. The top three charging station operators are TELD with 212,000 charging piles, National Grid with 196,000 charging piles, and Star Charge with 171,000 charging piles. The three operators account for 69.2% of the total number of public charging piles.

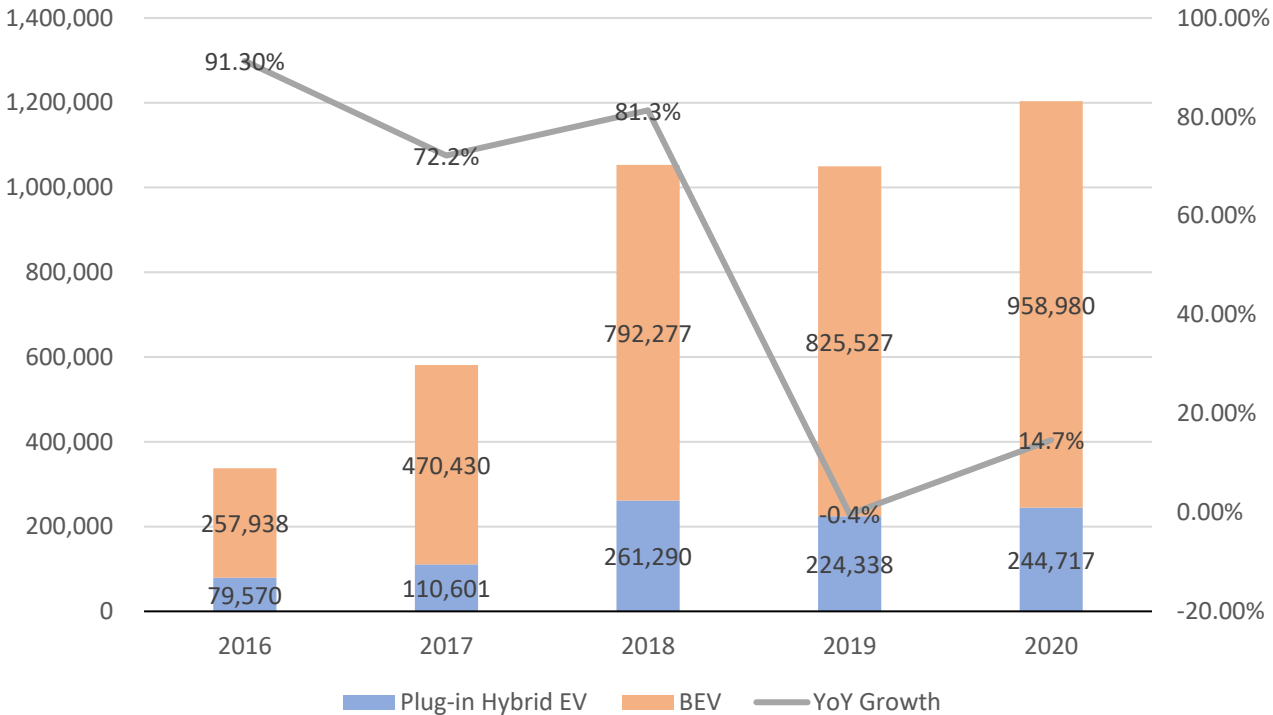
The commercial operators' charging bill consists of electricity fees and service fees. The bill ranges from 0.5 to 2.0 yuan per kWh, depending on location and time. In comparison, an EV user can install an AC charging pile at home and only need to pay the electricity fee at about 0.5 yuan per kWh. A typical EV user can expect a usage cost of around 0.1 to 0.2 yuan per kilometer, which is significantly lower than the usage cost of a conventional passenger vehicle.

3. NEV Market Sales

The NEV sales grew from 337,508 in 2016 to 1,203,697 in 2020. There was a decline in 2019 due to the large subsidy cut that year. During 2016 and 2020, the sales of PHEVs accounted for around

21.8% of the total NEV sales.

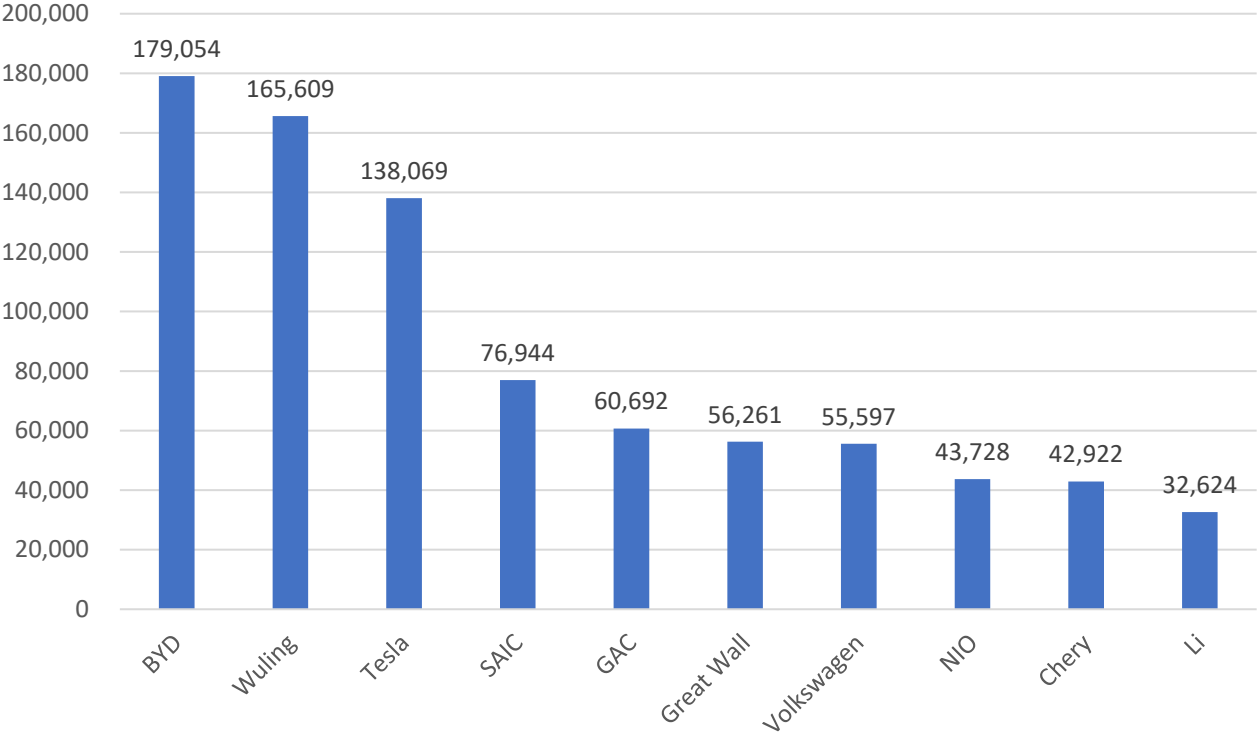
Exhibit 2: NEV Sales in China



Source: China Association of Automobile Manufacturers

The top 10 bestselling NEV manufacturers of 2020 are listed in Exhibit 3. The 10 automakers accounted for 73% of the total NEV market. Only Tesla and Volkswagen are international brands, while others are considered domestic brands.

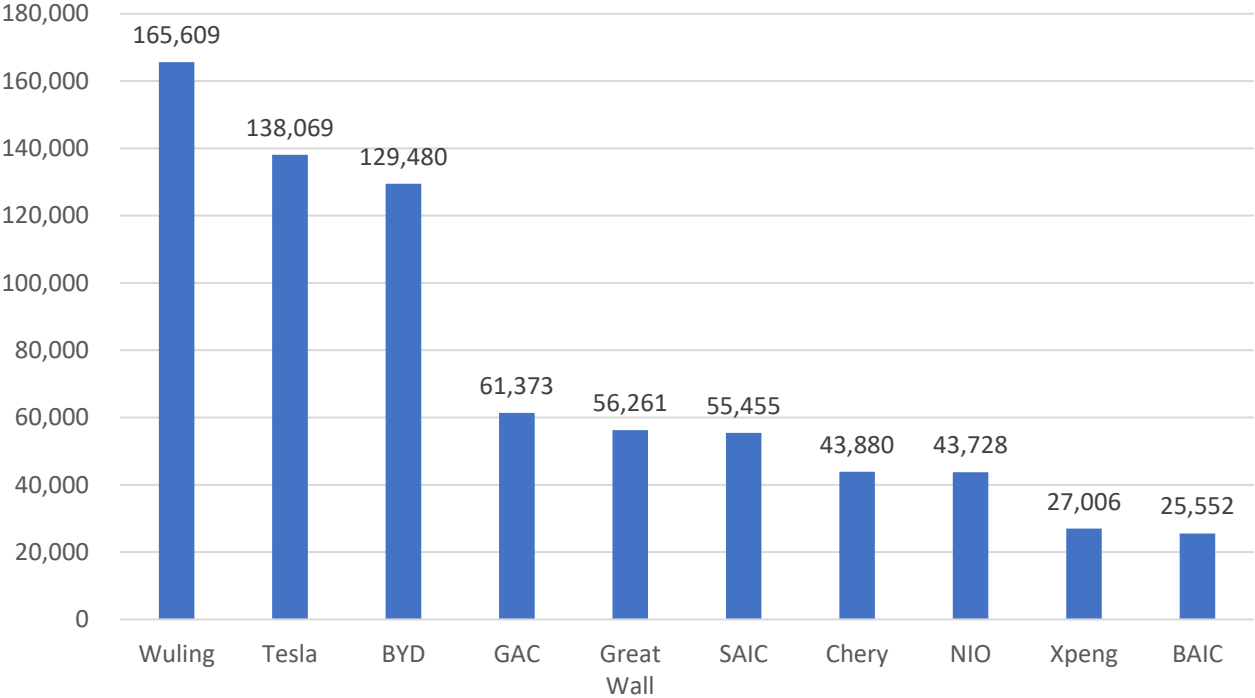
Exhibit 3: Top 10 NEV Automakers by Sales in 2020



Source: China Passenger Car Association

The top 10 bestselling battery BEV manufacturers in 2020 were different (*Exhibit 4*). Volkswagen and Li Auto were out of the top 10. XPeng and BAIC Motors joined the top 10 list. Because the NEV models of Volkswagen and Li Auto in 2020 were primarily PHEVs. The top 10 BEV brands accounted for 76% of the BEV market.

Exhibit 4: Top 10 BEV Automakers by Sales in 2020



Source: China Passenger Car Association

4. Case Study

4.1 SAIC-GM-Wuling

SAIC-GM-Wuling (SGMW) is a joint venture between SAIC Motor, General Motors, and Wuling Motors. Based in Liuzhou, Guangxi, SGMW is known for making economical passenger vehicles and commercial vehicles. The company sold 1.6 million vehicles in 2020.

Founded in 2002, SGMW started by building the Wuling microvan, nicknamed as “mianbao che” or bread loaf vehicle, which is a low-price vehicle. SGMW quickly grew into the category leader.

SGMW launched its second marque Baojun, which was positioned higher than the Wuling brand

and targeted the passenger vehicle market in 2010. Over the years, SGMW is known for launching highly successful models about every two years. Till today, most of its vehicle models are priced under 100,000 yuan, which makes the SGMW one of the most popular automakers in China with 2,900 dealerships across the country.

Because of the high cost of Li-ion batteries, and the low-price strategy, SGMW focuses on mini-EV. SGMW launched its first BEV, Baojun E100, in 2017. The Baojun E100 had a range of 155 km, just higher than the subsidy range standard of that year. It also introduced the Baojun E200 and Baojun E300 in 2018 and 2020 respectively. All three Baojun models are micro-EVs that are shorter than 3m.

The knowledge accumulation of producing Baojun EVs opened new possibilities for the next best-selling model of SGMW. It launched the Wuling Hongguang MINI EV in July 2020. Within months, the model became the best-selling EV in China. SGMW sold 119,255 MINI EVs in 2020, accounting for 80% of total BEV sales of SGMW after the model's launch. The Wuling MINI EV is a two-door four-seater with a length of 2917 mm, longer than any other Baojun EVs. But Wuling MINI EV is the cheapest model, starting at 28,800 yuan. The basic model is poorly equipped and has the lowest range in the market. It has two range versions: 120 km and 170 km, both lower than the required range of 300 km for subsidy. The fact that the model does not need subsidy, the first of its kind in the market, makes its success even more stunning.

The Wuling Hongguang MINI EV is positioned as a low-cost, low-range, and road-legal vehicle.

However, there is a massive low-speed micro-EV market in China. The low-speed vehicles use lead-acid batteries and have a top speed of 70 km/h. These low-speed vehicles look like a small car but are called the senior's scooters. Because these low-speed vehicles are not registered and do not require driving licenses. Most low-speed vehicles are made by small workshops with poor quality and low safety standards, and most are priced around 10,000 to 30,000 yuan. In total, 1.2 million low-speed vehicles were sold in 2019, signaling the strong potential demand. The Wuling MINI EV is a natural substitution for the low-speed vehicle. With its extensive dealership network and production capacity, SGMW can quickly discover this blue ocean market for car manufacturers.

The cubic design of Wuling MINI EV is simple and cute, drawing the adoration of young consumers. The nimble size makes it easy to drive and park. Despite the tiny size, it has 4 seats, providing decent practicality. And SGMW offers smart connectivity functions that allow an owner to check vehicle status on a phone. To control cost, the 120 km version has a 9.6 kWh battery, and the 170 km version has a 13.9 kWh battery. In comparison, a typical 300 km micro-EV has a 30-kWh battery. Assuming battery cost at 0.7 yuan per Wh, SGMW can save a battery expense by about 12,000 yuan in a vehicle. Besides, SGMW sources the battery from 4 suppliers to keep the battery price low. The vehicle can only be charged using the AC coupler, and it comes with a unique 220 V charger. Consumers can charge it directly from home without setting up the 380 V AC charging pile. The downside of this special AC charging design is the low charging power, only 2.5 kW, which is lower than the standard AC charging at 7 kW. But the small battery capacity means that the user can charge with a tolerable waiting time of 6.5 hours. The MINI EV is equipped with

safety functions such as ABS, EBD, reversing radar, and tire pressure monitoring. But it is not equipped with airbags, which is a noticeable reduction. The model does not have the Advanced Driver Assistance Systems (ADAS). Apart from the exterior and interior colors, consumers do not have other options to add when ordering the car. Besides the low-cost design and simple function of this car, the cost leadership know-how and experience, the high utilization rate (*Exhibit 5*), and the production scale of SGMW also ensured the low-price positioning of MINI EV.

Exhibit 5. SAIC Factory Utilization in 2020

Subsidiary	Designed Capacity	Actual Production	Utilization (%)
SAIC-GM-Wuling	1,760,000	1,555,000	88
SAIC Passenger Vehicle	800,000	641,000	80
SAIC-General Motors	1,908,000	1,410,000	74
SAIC-Volkswagen	2,088,000	1,496,000	72
SAIC Maxus	375,000	191,000	51

Source: Corporate annual report

The market success of SGMW’s micro EVs also had a positive impact on its dual credit accounts. According to the Ministry of Industry and Information Technology (*Exhibit 6*), the sales of BEV generated 440,477 NEV credit and led to a positive CAFC credit account, making SGMW the only subsidiary of SAIC with two positive credit accounts. The surpluses in dual credit are of great financial value and strategic importance to SGMW and the SAIC group.

Exhibit 6. SAIC Dual Credit in 2020

Subsidiary	Passenger Vehicle	CAFC Credit	NEV Credit
SAIC Passenger Vehicle	471,790	-100,032	99,441
SAIC Maxus	40,104	-39,703	3,439
SAIC-Volkswagen	1,499,191	-689,628	-92,930
SAIC-General Motors	1,344,729	-1,255,084	-116,785
SAIC-GM-Wuling	931,040	493,451	440,477

Source: Ministry of Industry and Information Technology of China

In conclusion, SGMW adopted the low-price strategy in the NEV market, and it achieved a head start in the zero-subsidy segment. Following SGMW’s lead, other automakers, such as Chang’an Automobile and JAC Motors, also introduced their low-range micro-EVs to the market in 2021.

4.2 Tesla

Tesla started as an electric racing car company in 2003. According to Elon Musk, the CEO of Tesla, the master plan was to “create a low volume car, which would necessarily be expensive. Use that money to develop a medium volume car at a lower price. Use that money to create an affordable, high volume car.” Tesla launched its first vehicle, the Roadster, in 2008. The Roadster was a two-seat sports car, and over 2000 were sold. Tesla entered the Chinese market with the Model S in 2014 and Model X in 2016. Both models were premium vehicles imported from the U.S. and were priced up to over 1 million yuan. The company then launched the reasonably priced Model 3 and delivered the Model 3 to the Chinese market in 2019. The starting price of the imported Model

3 was 433,000 yuan.

Imported cars from the U.S. were subjected to a 25% tariff, before July 2018. Then the tariff was lowered to 15% for a brief week. Because of the U.S.–China trade conflict, the tariff was raised to 40% since July 6th, 2018. The high tariff barrier, the low production cost, and the largest automotive market in China were compelling reasons for Tesla to set up a factory in the country. After years of contact with the central government and negotiation with several local governments, Tesla signed the contract in July 2018 to build its Gigafactory in Shanghai. The factory in phase one has a capacity of 250,000 vehicles per year. When fully built, the factory will have a capacity of 500,000 vehicles. The timing was clever, as the restriction of foreign ownership in NEV car companies was just lifted. Tesla became the first wholly foreign-owned vehicle enterprise in China.

Gigafactory Shanghai began producing Model 3 in December 2019 and producing Model Y in late 2020. Tesla's strategy in China is to utilize the low labor cost and local supply chain to ramp up the production and lower the product price, promoting the sales of its mid-size models. In January 2020, 30% of the parts in Model 3 were domestic. Tesla planned to increase the rate to 70%-80% by July and replace all imported parts with domestic products at the end of 2020. The made-in-China standard range version Model 3 was priced at 331,050 yuan after subsidy in December 2019. When it started delivering Model 3 orders in January 2020, Tesla lowered the model's price to 299,050 yuan. In May, the price was lowered to 271,050 yuan. Then in October, Tesla introduced the Lithium iron phosphate (LFP) battery version Model 3, reducing the price to

249,900. The previous Model 3 was equipped with a lithium-manganese-cobalt-oxide (NMC) battery from the Korean supplier LG. The LFP battery is from CATL, a leading Chinese battery manufacturer. LFP battery is cheaper than the NMC battery, but of lower power density than that of NMC battery (*Exhibit 7*).

Exhibit 7. Standard Range Model 3 Battery Comparison

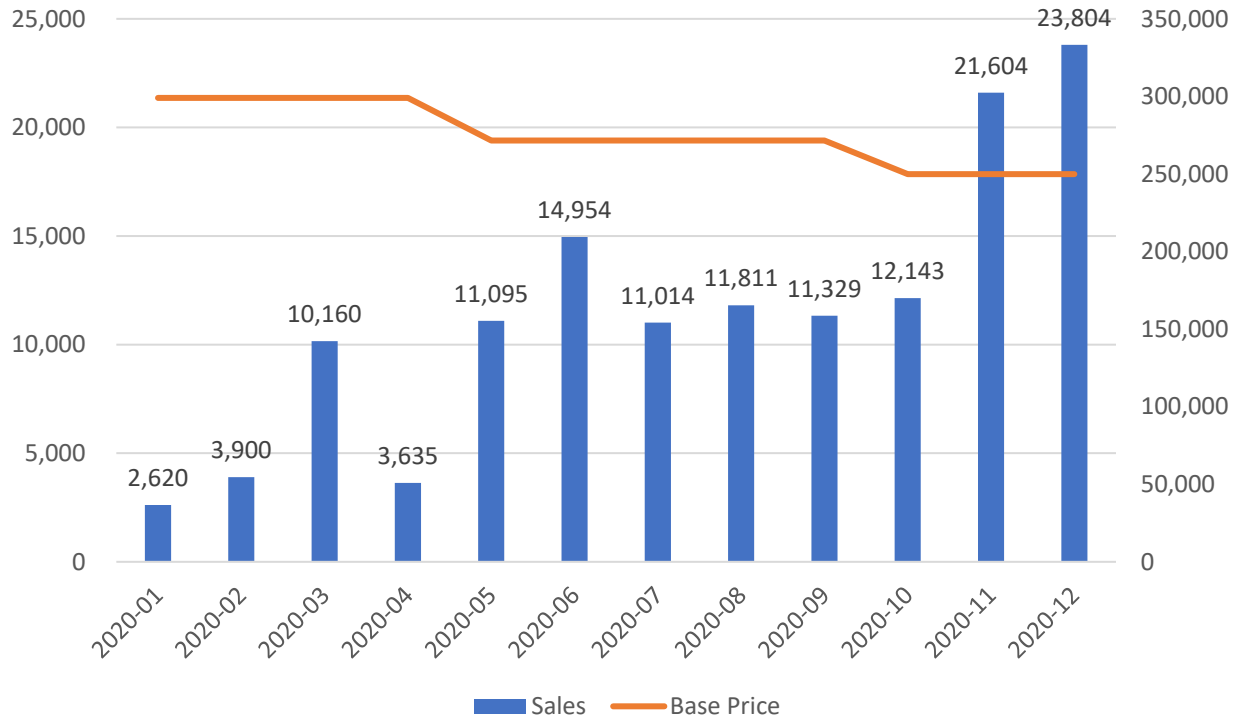
Battery Version	Range (km)	Vehicle Weight (kg)	Battery Weight (kg)	Battery Power (kWh)	Energy Density (Wh/kg)
LFP	468	1,745	440	55	125
NMC	445	1,614	345	52	151

Source: Ministry of Industry and Information Technology of China

Within one year, the price of the standard range version Model 3 was reduced by 81,150 yuan or 25% off the initial price. The price of the long-range Model 3 was also reduced from 339,050 yuan to 309,900 yuan. From a traditional carmaker’s perspective, the price-cutting strategy is highly unusual for a popular car model. Tesla adopts a direct sales model and only relies on its online purchase channel. Customers can test the car at its galleries. This direct online sales model enables Tesla to accumulate orders in real-time and change prices without dealer interference that other automakers might have. The price cuts created competitive advantages for Tesla, drew consumer’s attention, and caused challenges for other carmakers with similar products. The Chinese consumers reacted favorably to the price cuts. 138,069 Model 3s were sold in 2020

(Exhibit 8), making Model 3 the highest-selling EV in revenue.

Exhibit 8. Tesla Model 3 Sales and Standard Range Version Price in 2020



Source: China Passenger Car Association

Tesla enjoys a strong brand image in China. Because Tesla entered the luxury segment first with its iconic Model S. Many Chinese consumers perceive Tesla as a premium international marque. The company and its CEO Elon Musk get lots of free media coverage on the Chinese Internet. The company relies heavily on word-of-mouth and invests little in advertisements.

As a sporty EV, Model 3 has quick acceleration and lowered suspension. As the leader in smart EVs, Tesla equipped the Model 3 with state of art human-machine interface (HMI) through the large screen and connectivity feature that allows users to check vehicle status and control vehicle

functions from smartphones. Model 3 is also equipped with the hardware, such as cameras, radar, ultrasonic sensors, and computational chips, that enable the implementation of the Autopilot driver assistance system. Basic Autopilot is standard in Model 3. However, only 1%-2% of Model 3 owners are willing to pay extra 64,000 yuan to have the Full Self-Driving option. Because the FSD is not fully functional, and consumers might have safety concerns. The model has a simple or basic interior design, which draws polarized opinions. Some advocates think the minimalist and futuristic appearance shows that Tesla is a revolutionary car company. Other opponents deem the interior, especially the material, cheap or low-quality for a premium car.

Tesla's models in China are equipped with GB standard charging portals, and Tesla is committed to building its Supercharger network in China. The latest V3 Supercharger is capable of 250 kW DC charging, which is 2 times the standard 120 kW DC charging. Tesla also built its Supercharger factory in Shanghai with a production capacity of 10,000 piles per year. The extensive Tesla charger network is one important reason why consumers choose Tesla over others, and it gives Tesla competitive advantage. First, Superchargers are maintained regularly, and drivers experience less malfunction in Superchargers than in other public chargers. Second, Tesla's proprietary charging standard is fast, and the integrated charging platform of piles and vehicles enables Tesla to gather valuable data on both ends and improve the charging function constantly. Third, a carmaker's charging infrastructure can lower the risks if other public chargers are not available for consumers. Because the charging infrastructure is investment heavy where operators might face the risk of bankruptcy.

As the pioneer and leader in EVs, Tesla leveraged its first-mover advantages, strong brand, flexible pricing, charging infrastructure, and most importantly, excellent vehicles to succeed in the Chinese automotive market.

4.3 BYD

BYD was founded in 1995. It started as an electronics company making batteries for electric devices. Over the years, it grows into a conglomerate with business spanning electronics, battery, automotive, solar cell, and light rail, etc. BYD entered the auto business in 2003 after acquiring a small auto company in northern China. The company leveraged its battery business to be a leader in NEV technologies. BYD launched its first mass-produced new energy car F3DM in 2008, which was a PHEV compact sedan.

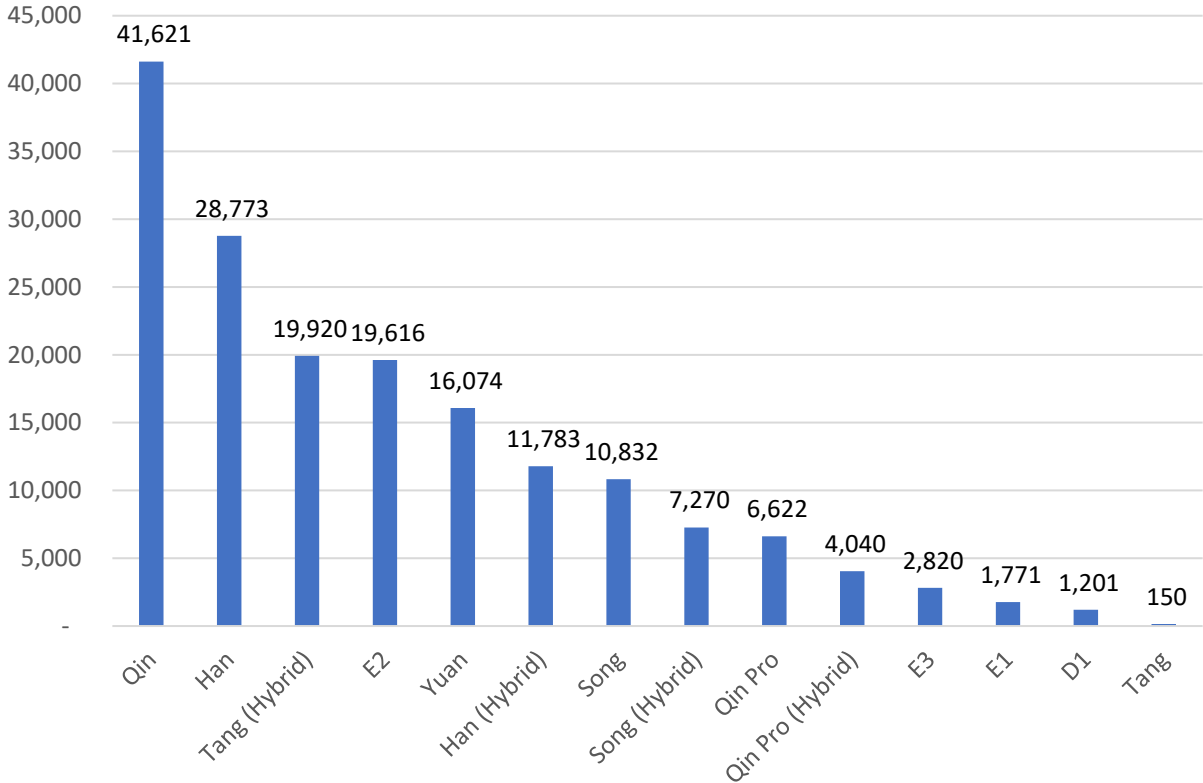
The brand BYD is the initials of its Chinese pinyin *Bi Ya Di*. The company explained that the name BYD is an abbreviation of “Build Your Dreams”. Its Chinese name has no specific meaning. Like many other early domestic carmakers, BYD started from the low-end segment. It produced a series of models that suspiciously resembles popular Japanese cars. And many consumers considered BYD a cheap or low-quality brand. As a result, the BYD marque became a hindrance for BYD’s upgrade to the premium segment. Since 2013, BYD has adopted a sub-brand strategy for its new energy vehicles. It launched a series of PHEVs and BEVs under some historical Chinese dynasty names (*Exhibit 9*). The logo on the dynasty model is the corresponding Chinese character in the seal script, ditching the BYD logo. But the dynasty brands are under the BYD umbrella brand, so the negative impression still exists.

Exhibit 9. BYD Dynasty Sub-brands

Brand	Vehicle type
Han	Mid-size sedan (electric/ plug-in hybrid)
Tang	Mid-size SUV (electric/ plug-in hybrid / gasoline)
Song	Compact SUV or MPV (electric/ plug-in hybrid / gasoline)
Qin	Compact sedan (electric/ plug-in hybrid / gasoline)
Yuan	Subcompact SUV (electric)

BYD has the largest number of NEV models in the market. The product mix ranges from a 59,900-yuan E1 electric hatchback to a 314,800-yuan Tang electric SUV. BYD takes a balanced approach between PHEV and BEV. Most of its new energy models have two versions, hybrid and electric. The reasons behind this balanced strategy are that BYD has leading hybrid vehicle know-how and BYD is producing the engine, motor, battery, and controls in-house at low cost. BYD can sell PHEVs at similar prices to other gasoline vehicles. And the PHEVs can draw consumers who value economy but are hesitant in buying BEVs.

Exhibit 10. BYD New Energy Vehicle Sales by Model in 2020



Source: China Passenger Car Association

As shown in the above sales figure of 2020, Qin was the highest-selling one, and the model mainly focused on business fleets, such as taxi and ride-hailing business. Among BYD’s product portfolio, the Han electric sedan, launched in July 2020, was the most popular premium model. BYD Han is a mid-size sedan in direct competition with Tesla Model 3. BYD Han starts at 229,800 yuan and has a larger size than the Tesla Model 3. The basic version has a range of 605 km, which is 137 km more than the range of a basic Model 3. Han has a luxury interior design with leather and wood. BYD offers to install a free home charging pile for Han owners, while Tesla owners have to pay extra for charging piles at home. The car infotainment system of BYD is based on the Android

system, which means there is good flexibility and connectivity for users to install applications and to link from smartphones. But BYD Han is behind the Tesla Model 3 in the ADAS function. In some consumers' opinion, BYD Han has a better cost performance than that of Model 3.

The company is vertically integrated with NEV production. It manufactures the battery, motor, and controls for its NEV. BYD can produce NMC batteries and LFP batteries. Recently, BYD has become an advocate for LFP batteries. It patented an LFP battery design called Blade Battery. The battery cell is shaped like a long panel. Then the singular cells are arranged together in an array. Due to its unique battery pack structure, the space utilization of the battery pack is increased, and the energy density is increased as well. BYD also advertised heavily about the safety feature of its LFP battery. Namely, the Blade Battery has a lower risk of catching fire than other Lithium batteries. The company showcased the result of a nail penetration test, in which the NCM battery was severely damaged with surface temperature exceeding 500 Celsius degree, and the BYD Blade Battery did not have a fire or smoke with a surface temperature of 30 to 60 Celsius degree. BYD has planned to roll out the Blade Battery on all its electric models, and BYD has contracted to supply the battery to other carmakers.

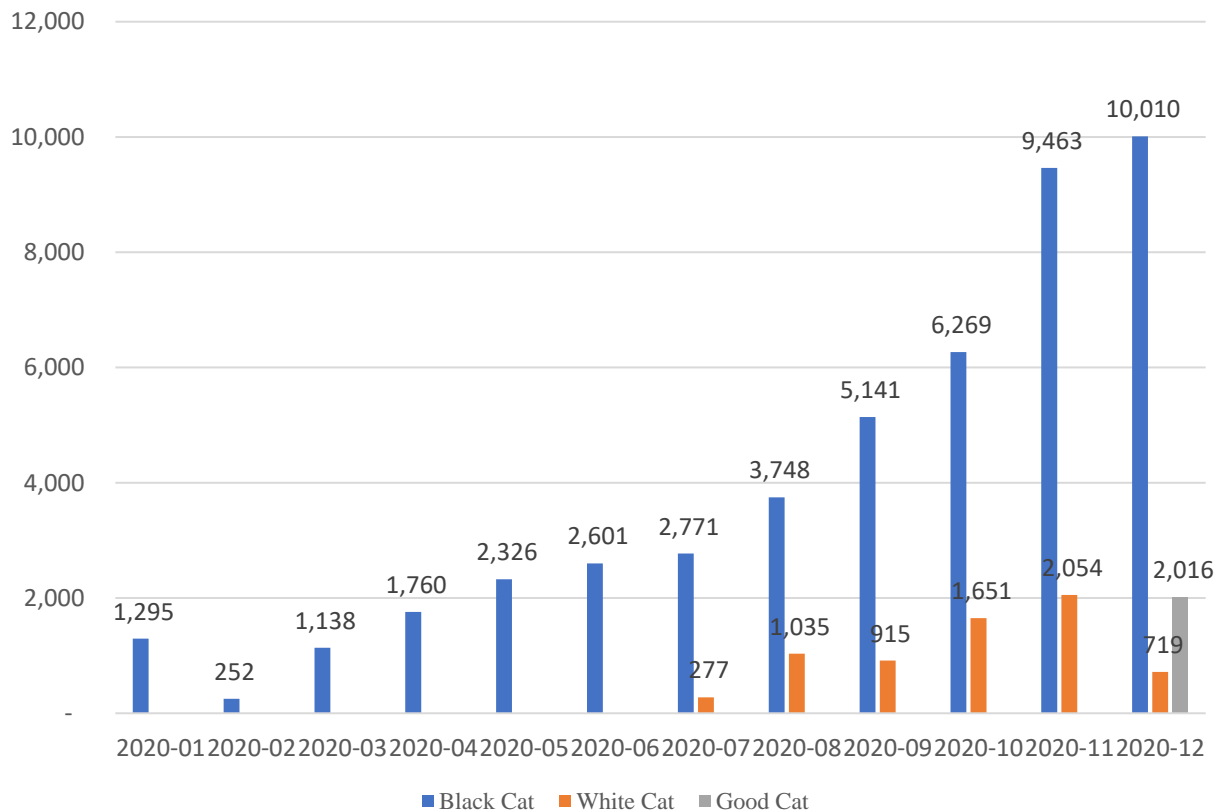
In 2020, BYD remained the largest new energy carmaker in China. BYD is committed to both plug-in hybrid vehicle and battery vehicle to utilize its technology advantage. And It leverages the new NEVs to compete in the premium segment.

4.4 Great Wall

Great Wall Motors Company is based in Baoding, Hebei. It is the largest SUV and pick-up truck manufacturer in China. It sells pick-up trucks under the Great Wall brand and SUVs under the HAVAL and WEY brands. Great Wall Motors launched the ORA brand for the BEV business in 2018. According to the company, the brand "ORA" is to commemorate the Swiss mathematician and physicist Leonhard Euler.

The first ORA vehicle is the ORA iQ, which is a compact sedan mainly for business users, such as Great Wall's ride-hailing business. Then Great Wall positions ORA as the car brand for women and names ORA models after cats. Targeted at young women, the three main models are Black Cat, White Cat, and Good Cat. Black Cat and White Cat are of similar engineering underneath but different looks. Both are hatchbacks with prices from 70,000 yuan to 90,000 yuan. Good Cat is a compact hatchback equipped with ADAS function, starting at 103,900 yuan. The best-selling one among the three was Black Cat (*Exhibit 11*).

Exhibit 11. ORA Sales by Models in 2020



Source: China Passenger Car Association

To appeal to women’s preferences, all three ORA cat models have cute designs and a dozen colors to choose from. And all models have an Android-based infotainment system with localized application. ORA launched co-brand makeup, skincare, and beverage products with other popular brands to state it as a women’s brand. The prices, designs, colors, and smart functions make the models competitive in the market. Black Cat is the third best-selling BEV in 2020, just after Wuling MINI and Tesla Model 3. Great Wall will launch more ORA cat models, including SUV and coupe in 2021. This indicates Great Wall’s capability on the fast roll-out of new BEVs. The ORA brand’s unconventional brand statement, “the car brand that loves women more”, shows

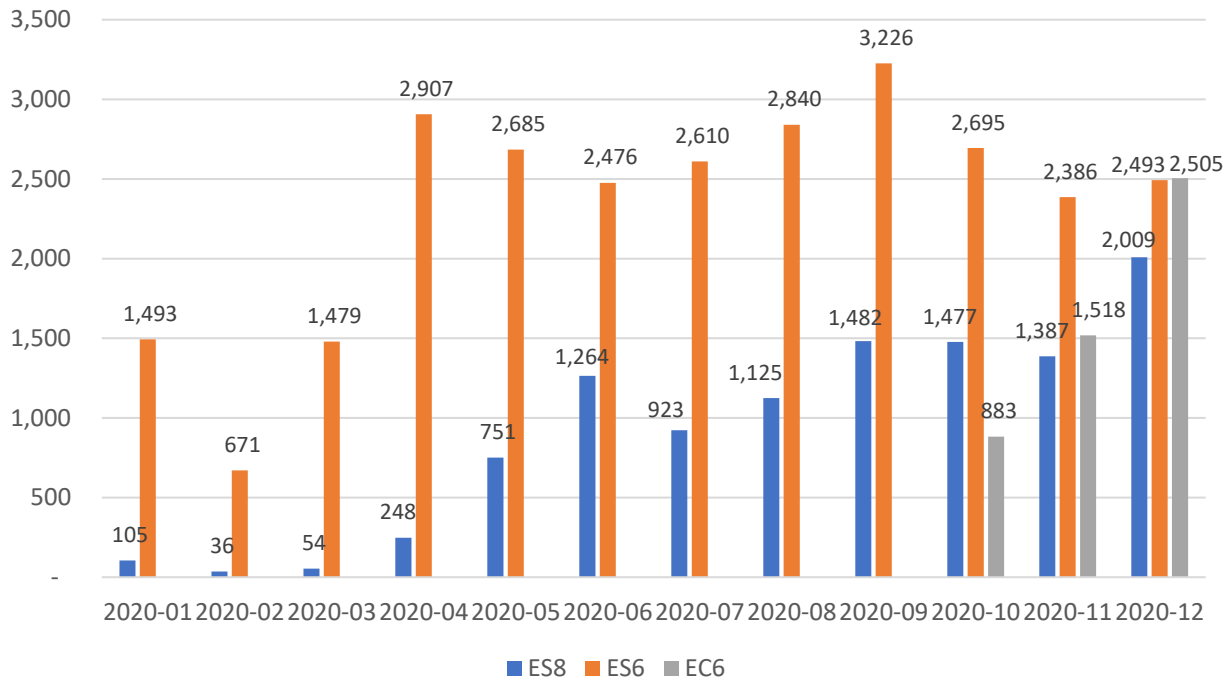
the importance of sensing consumer preference and its differentiation.

4.5 NIO

NIO is a BEV manufacturer founded by Li Bin in 2014. Before NIO, Li Bin founded a successful automobile website called BitAuto. He envisioned NIO as a premium BEV maker. The company followed a similar path with Tesla in developing expensive models first.

The first BEV of NIO was EP9, which is a supercar. The EP9 set a record as the fastest BEV at the Germany Nürburgring track in 2017, helping position NIO as a premium brand. The company also participated in Formula E racing before selling the racing team in 2019. The company currently has three BEV models in the market. They are ES8, ES6, and EC6. ES8 is a full-size SUV launched in 2018, and its prices range between 468,000 yuan and 624,000 yuan. ES6 is a mid-size SUV that is priced at 358,000 yuan to 526,000 yuan. And EC6, the latest model, is a mid-size coupe SUV with prices from 368,000 yuan to 526,000 yuan. The cars are well designed. In total, NIO sold 43,728 vehicles in 2020 (*Exhibit 12*). NIO is one of the few domestic car makers that can sell passenger vehicles priced beyond 350,000 yuan.

Exhibit 12. NIO Sales by Model in 2020



Source: China Passenger Car Association

Like Tesla, NIO sells vehicles directly to end-users. The company operates NIO House and NIO Spaces that look like clubs and invites owners over for NIO community activities. Those stores are located at expensive malls to reach potential customers. NIO runs an active online platform through its mobile application where people can place orders and control vehicles. The company rewards users' active engagement in the online community with tokens for service and gifts. The company maintains the connection and values the relationships with its owners. And the company can influence and educate owners through its application and forum. Many users become active followers and firm believers in NIO's development. The word-of-mouth effect is quite strong.

NIO is known for its high standard service. A new NIO vehicle owner is entitled to a lifetime free warranty, roadside rescue, and car connectivity services. Besides the basic service, NIO also provides service subscription options, which cost about 13,000 yuan per year and include insurance, repairment, maintenance, car washing, and chauffeuring, etc. The owner can have the car maintained or washed without driving to and waiting at the service station because the owner can order on the phone and NIO will send someone to do all the chores and drive the car back. When the owner wants to sell the car, the company even offers a trade-in service.

Battery swapping is a unique feature of NIO's BEVs. ES8, ES6, and EC6 use the same removable battery design so that NIO's batteries are interchangeable between different models. NIO operates battery swap stations where the user can have the depleted battery swapped with a fully charged one through an automatic process in minutes. Based on this battery swap feature, the company offers the choice where users can rent the battery for a monthly fee, saving the upfront battery cost when buying the vehicle. NIO offers to install home charging piles for users. The company also operates public charging stations and mobile battery vans. The mobile battery van can drive to the customer's vehicle and charge it using an onboard battery. NIO also provides an energy subscription service for about 10,800 yuan per year. The subscription user can have the firm pick up the vehicle, charge the battery and drive it back for you.

NIO believes that the unique services are its core competitiveness and succeeds as the domestic premium BEV leader. Partly due to its emphasis on services, the company incurred high expenses and huge losses since its foundation. The company needs to keep financing. As a result, NIO did

not have money in the past to set up a factory. The company partnered with the state-owned JAC Motors for manufacturing, according to a local government's investment requirements.

4.6 Other Major NEV Manufacturers

4.6.1 SAIC Motor

SAIC Motor, formerly Shanghai Automotive Industry Corporation, is the largest automaker in China, because it has joint ventures with Volkswagen and GM. It is a state-owned company headquartered in Shanghai. It produced NEVs under the Roewe and MG marques. Its best-selling BEV in 2020 was MG EZS, which was for export. The next best-selling one was Roewe Ei5, a compact sedan mainly for business fleets. The third one was CLEVER, a micro hatchback starting at 45,999 yuan. Of the top 3 models, only the CLEVER was mainly bought by private consumers.

SAIC's performance is representative of many domestic automakers. The popular BEV is a low-range micro vehicle with a price under 100,000 yuan. The compact BEV with a price above 100,000 yuan is not well recognized among private consumers, and the model instead are sold at a low margin to the corporate fleet segment. To improve its situation, SAIC has launched two new BEV brands that target the premium segment.

4.6.2 GAC

Guangzhou Automobile Group Co. (GAC) is a state-owned automaker based in Guangzhou, Guangdong. The company sells its BEV under the AION brand. The best-selling BEV model in 2020 was AION S, a compact sedan. The majority of AION S was sold to commercial fleets, such as

GAC's ride-hailing business.

4.6.3 Volkswagen

About 77% of Volkswagen's NEV sales in China in 2020 were PHEVs, such as Tiguan L, Passat, and Tayron. The remaining 23% of sales in 2020 were BEVs such as Golf, Bora, and Laida. Volkswagen has introduced the new BEV ID.4 to its two Chinese joint ventures in 2021.

4.6.4 Chery

Founded in 1997, Chery Automobile Co is an automobile manufacturer headquartered in Wuhu, Anhui. About 87% of its BEV sales in 2020 were Chery eQ1s. Chery eQ1, also known as Chery Ant, is a small two-door hatchback with a price starting at 66,800 yuan. It was the third best-selling small BEV in 2020, after Wuling Hongguang MINI EV and ORA Black Cat.

4.6.5 Li Auto

Li Auto was founded by Li Xiang in 2015. Li Xiang founded a popular automobile website Autohome. The company launched Li Xiang One in 2019. Li Xiang One is a PHEV SUV. Specifically, the model is a range extended vehicle. The engine only functions as a generator to the battery, and motors use the electricity to drive the car. Li Xiang One is a premium vehicle priced at 328,000 yuan.

4.6.6 XPeng

XPeng Motors was founded in 2014 in Guangzhou. The CEO He Xiaopeng developed a popular

phone browser and sold the business to Alibaba. XPeng, NIO, and Li Auto are considered the leaders in the wave of NEV start-ups. The three CEOs all have successful internet entrepreneurship experiences. XPeng wants to be the smart BEV company that understands China. It has two models in 2020, P7 and G3. P7 is a mid-size sedan starting at 229,900 yuan. P7 competes with Tesla Model 3 and BYD Han in the premium sedan segment. G3 is a compact SUV priced at 146,800 yuan.

4.6.7 BAIC

BAIC Motor is a state-owned automobile manufacturer headquartered in Beijing. Its best-selling BEVs in 2020 were the EU series, which relied on key account purchases. As its business fleet customers reduced procurement in 2020, BAIC's BEV sales suffered a lot. BAIC introduced a new brand, ARCFOX, for the premium segment.

4.7 Comparisons of Different Cases

Based on the above cases, the NEV market can be categorized into five segments based on prices, and the differentiation within each segment can be further analyzed as follows.

Models with prices greater than 300,000 yuan

This is the most expensive segment. Historically, this category was mainly occupied by models from international brands. In the NEV era, new brands have entered this segment. Specifically, Tesla Model Y and Model 3 Performance; NIO ES8, ES6, and EC6; Li Xiang One; and XPeng P7 Performance fall into this segment.

Models with prices between 200,000 yuan and 300,000 yuan

This premium segment is a busy place in 2020 and 2021 where manufacturers of five different camps compete together. First, there is the Tesla Model 3. Second, there is XPeng P7. XPeng is in the pure NEV start-up camp. Then, there is BYD Han. BYD is in the traditional carmaker camp. Furthermore, Volkswagen ID.4 of this price segment would launch in 2021. Volkswagen is in the traditional international camp. Last, there are models under the new NEV brands from state-owned companies, such as ARCFOX αT from BAIC and Marvel R from SAIC. State-owned companies have stable cash flows from their joint ventures, but they are weaker than other domestic brands in building and selling domestic marque vehicles.

This premium segment becomes crowded because the high price can cover the cost of a good electric powertrain and battery, enabling NEVs to compete with similarly priced traditional vehicles. Besides, the price can support the cost of ADAS function, connectivity ability, and smart HMI feature that consumers put high expectations on. Furthermore, the segment is the stronghold of traditional international brands and is suitable for domestic brands to implement upmarket product line stretching.

For the first two premium segments, smart mobility is a key consumer consideration in deciding which cars to buy. This drives carmakers to develop up-to-date smart features, such as the ADAS, over-the-air programming (OTA), HMI, connectivity, and autonomous driving. Automakers, however, differ significantly in the capability. Generally, some native NEV start-ups can develop the software and hardware in-house. Tesla and XPeng are leading in this category. They can be

more flexible and more agile in implementing new functions. Other legacy automakers need to partner with auto part suppliers, such as Bosch, Continental, and Aptiv, or tech companies, such as Baidu and Huawei, to integrate those functions.

Models with prices from 100,000 yuan to 200,000 yuan

This segment includes compact sedans and SUVs. And a big portion of the sales focuses on business usage of key accounts. The ranges are around 400 km or 500 km for models with big enough batteries. Typical models include GAC AION S, BAIC EU, SAIC Roewe Ei5 and BYD Qin, etc.

Economical models between 50,000 yuan and 100,000 yuan

This segment includes small BEVs for daily usages, such as ORA Black Cat and White Cat, Chery eQ1, and SAIC CLEVER, with ranges around 300 km. Descent functionality, cost control, and customer targeting are important factors for a model's success.

Models under 50,000 yuan

The last segment focuses on consumers with a limited budget. Wuling Hongguang MINI EV is a typical model of this segment. Even though the price is low, a successful model like Wuling MINI can sell in massive volume, generate dual credit for compliance, and create a marketing effect for the brand.

5. Conclusion

Through the analysis of the leading NEV manufacturers in China, one can conclude that the

market of NEV in 2020 finished with a strong second half, growing 14.7 % over the previous year. Though Europe surged into the world's biggest electric car market in sales, China is still the world's leader in NEV with the largest number of new energy vehicles. The strategies of these automakers provide invaluable insights into the future of NEV.

Based on the analysis, these three trends may take place: (1) There will be more competition in the premium segment (beyond 200,000 yuan) and economical segment (below 100,000 yuan). Because the economical segment can meet consumers' need for cheap transportation. This potential demand can be massive. The premium models can have a high level of smart mobility features that consumers are willing to pay for. Whereas because of the cost of batteries, the middle segment BEVs cannot compete with conventional vehicles. Many automakers, under the pressure of dual credit, will enter the EV market with competitive products. (2) The smart level of NEVs will keep increasing. Consumers value the HMI, connectivity, and ADAS features. Many automakers view intelligent features as core competencies. (3) The portion of LFP batteries in NEVs will increase in the next few years. Under fierce competition, the leading firms are adopting LFP batteries. LFP battery's energy density can be increased with battery structure improvement, and its features such as low cost and safety will be valued by automakers and consumers.

Under these trends, my recommendations for automakers include: (1) Automakers should provide good service to customers, keep connection with customers, and engage with customers. This would keep customers happy and loyal. (2) Automakers should keep investing and developing connectivity, ADAS, and HMI features. (3) Automaker should keep improving the

electric powertrain system's efficiency and maintaining close collaboration with battery suppliers.

(4) Automakers can offer subscription services, such as insurance, vehicle maintenance, battery charging, smart function, or content subscription in cars, that lead to new revenue streams.

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