New Energy Buses in China

Overview on Policies and Impacts

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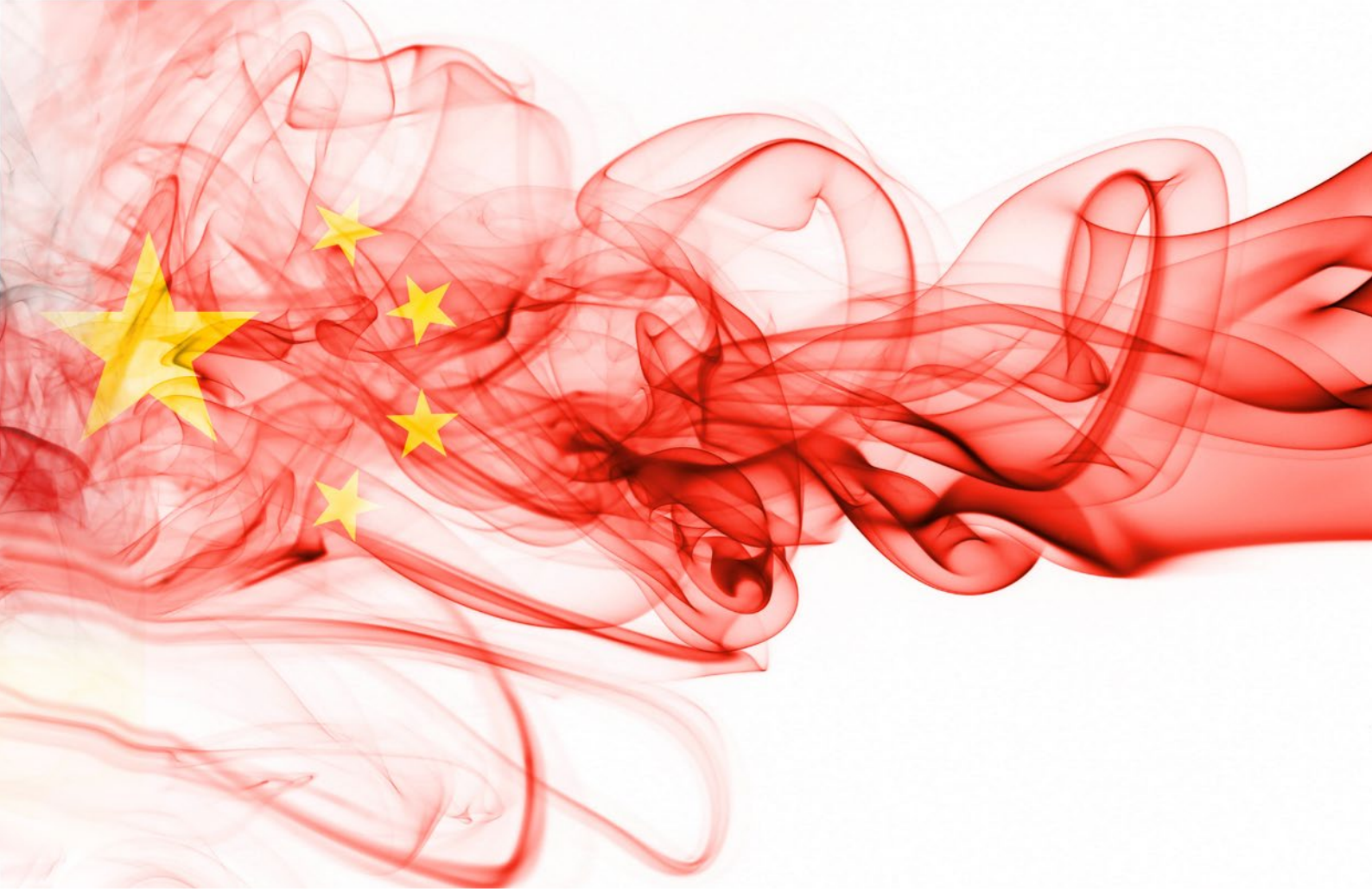

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List of Abbreviations

BEV	Battery-Electric Vehicle
CAGR	Compound Annual Growth Rate
CATARC	China Automotive Technology and Research Center Co.,Ltd
DRC	Development and Reform Commission
EUR	Euro
FCV	Fuel Cell Vehicle
Jing-Jin-Ji	Beijing-Tianjin-Hebei
MIIT	Ministry of Industry and Information Technology of the People's Republic of China
MoF	Ministry of Finance of the People's Republic of China
MoHURD	Ministry of Housing and Urban-Rural Development of the People's Republic of China
MoST	Ministry of Science and Technology of the Peoples' Republic of China
MoT	Ministry of Transport of the People's Republic of China
NDCs	Nationally Determined Contributions
NDRC	National Development of Reform Commission
NEA	National Energy Administration
NEV	New Energy Vehicle
NO	Nitrogen Oxide
PHEV	Plug-In Hybrid Electric Vehicle
PM	Particulate Matter
R&D	Research and Development
RMB	Renmimbi
TCO	Total Cost of Ownership

Currency Equivalents (as of April 2020)

Currency Unit	-	Renmimbi (RMB)
RMB 1.00	=	Euro 0.13
EUR 1.00	=	RMB 7.63

New Energy Buses in China - Overview on Policies and Impacts

Background

Electro-mobility and New Energy Vehicles (NEV)[1] are important elements of the Chinese government's strategy to promote climate-friendly and sustainable transport. In particular, the promotion of public transport and the adoption of New Energy Buses play a central role in realizing those ambitions. In recent years, China's central government and local authorities have launched various support policies to push market development, foster advanced industry chains, create a skilled labor force and to achieve technological breakthroughs and efficiency gains in the field of New Energy Bus technology. Supportive policies include subsidies for purchasing and operating New Energy Buses, as well as tax reductions and other incentives for phasing out and decommissioning buses with conventional combustion engines.

By the end of 2019, more than 400,000 New Energy Buses were in operation in China. The share of New Energy Buses in the overall bus market increased from about 1% in 2013 to 55% in 2019. By the end of 2018, in the 10 air pollution control and prevention areas[2] Beijing, Tianjin and Hebei (Jing-Jin-Ji), Shanghai , Shanxi, Jiangsu, Zhejiang, Shandong, Guangdong and Hainan, the average share of New Energy Buses (excluding hybrid buses) in the total public bus vehicle fleet exceeded 50%, while in the 9 central provinces Fujian, Jiangxi, Hunan, Hubei, Henan, Anhui, Shanxi, Guangxi, and Qinghai province this share was 40% and in other provinces 30% respectively.

While in particular the development and adoption of battery-electric buses saw a rapid uptake in recent years, the uptake of fuel cell electric buses still faces various issues. Even though, according to industry surveys and expert consultation, it is estimated that more than one million fuel cell electric vehicles will be put into operation in China by 2030 (passenger cars, buses, light-, medium- and heavy duty and special purpose vehicles), a wide adoption of fuel cell electric buses in a near term is difficult, due to insufficient technological levels, insufficient hydrogen refueling infrastructure, and generally high costs.

With the implementation of the so called "green revolution", China's ambition to promote low carbon, clean transport, the adoption of electro-mobility is further accelerating, in particular in the field of public transport. To achieve the "true" electrification of urban public transport and to further reduce carbon emissions, it is necessary to deepen the reform of the energy sector. This includes the promotion of renewable energy and the enhancement of energy conservation and energy efficiency. In addition, the acceleration of the construction of charging infrastructure and increased overall system efficiency is crucial for the further successful promotion of New Energy Buses and NEVs in China.

1. Overview on the development of NEVs in China

Against the background of energy safety demand, to achieve energy conservation and energy efficiency as well as to achieve carbon emission and air pollutant reduction,

1 In China, the term NEV refers to plug-in hybrid vehicles (including extended-range vehicles), BEV and fuel cell vehicles according to the Energy Conservation and NEV Industry Development Plan (2012-2020) issued by The State Council of the People's Republic of China in 2012.

2 In 2015, the Ministry of Finance together with the Ministry of Industry and Information Technology, and the Ministry of Transport issued the "Notice on Improving the Price Subsidy Policy for urban bus Oil Products to accelerate the Promotion and Adoption of NEV (2015)", stating that key regions and provinces for air pollution control and prevention include Beijing, Shanghai and Tianjin, Hebei, Shanxi, Jiangsu, Zhejiang, Shandong, Guangdong and Hainan.

but also to promote the further development of the automotive industry and related core technologies, China has issued various support and promotional policies to achieve the uptake of NEVs and in particular New Energy Buses.

From 2000 to 2008, the "Three verticals and three horizontals" R&D layout[3] concept was adopted by the Ministry of Science and Technology (MoST) to achieve the breakthrough of NEV core technologies, and to realize the establishment of the NEV industry from scratch. In 2009, the MoST, the Ministry of Finance (MoF), the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT) jointly launched the "Ten Cities and Thousands Vehicles" pilot program (2009 to 2012)[4]. The aim of the program was to firstly promote NEVs in the urban public transport sector and taxi services area, aiming at achieving an early stage market-oriented development in selected key and pilot areas. In terms of top-level policy, the NEV industry was already listed in the 12th Five-Year Plan (2011-2015) as one of China's strategic emerging industries.

According to the China Automotive Technology and Research Center (CATARC), the country's NEV industry has adopted a "3-Steps" development strategy[5]:

1. 2009 to 2012 – NEV uptake phase:
Initial NEV development and market uptake through the establishment of pilot demonstration zones and cities;
2. 2013 to 2015 – NEV market development phase:
Further development of the NEV market and increasing number of pilot cities and city clusters;
3. Since 2016 - Nationwide NEV mass adoption phase:
Improvement of technology, product safety and reliability, battery technology and continuous dropping costs, in particular of batteries; nationwide adoption of NEVs. The 3-steps development strategy led to a nationwide promotion and adoption of NEVs based on the approach: "From pilot implementation (with a focus on public transport) to cross-sector-wide NEV promotion to the promotion of NEVs in the whole automotive industry", supporting the industry's transition from the start-up phase to the rapid development phase.

2. Responsibilities of departments for the promotion of urban buses

Various governmental departments are responsible for the development and promotion of the NEV industry in China. Among them are:

1. National Development and Reform Commission (NDRC) - NDRC has broad administrative and planning control over China's economy. NDRC plays a leading role in drafting industrial policy and promoting sustainable development, including plans for energy saving and emission reduction.
2. Ministry of Industry and Information Technology (MIIT) - MIIT is responsible for NEV product and enterprise market entry permission (e. g. permission for bus manufacturers to enter the market).
3. Ministry of Finance (MoF) - MoF is responsible for formulating fiscal and taxation policies for the purchasing and operation of NEVs.
4. Ministry of Transport (MoT) - MoT is the primary supervision department responsible for planning and operation management of urban and rural passenger

3 "Three verticals" refers to hybrid vehicles, pure Battery-Electric Vehicles (BEV) and Fuel Cell Vehicles (FCV). "Three horizontals" refers to multi-energy powertrain control systems, engine and engine control systems, and battery and battery management systems.

4 The "Ten Cities and Thousand Vehicles" pilot project aimed at promoting NEVs in 10 cities per year through financial subsidies provided by the government. Each city launched 1,000 NEVs for pilot operation (mainly public transport, taxis, governmental and municipal transport and postal services). The ultimate goal of this project was to increase the market share of NEVs in the whole industry to 10% by 2012.

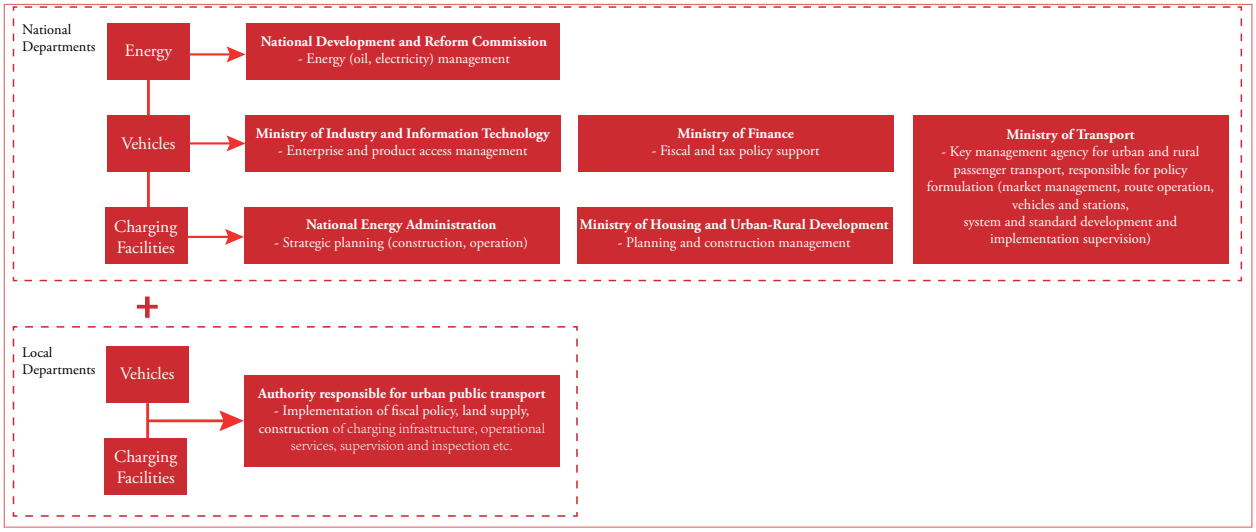
5 "3 Steps" development strategy: 1. from 2009 to 2012, the NEV market was expanded through the establishment of pilot demonstrations in several cities; 2. from 2013 to 2015, a relatively bigger market firstly appeared, the number of pilot cities/city clusters continued to grow; 3. since 2016, technological levels and engineering capacities have been significantly improved, and the cost for NEVs and has dropped constantly; nationwide adoption was prevailed.

transport services, vehicles, stations and facilities. MoT is also responsible for drafting relevant policies, rules and standards and for monitoring their implementation.

5. National Energy Administration (NEA) under the NDRC NEA is responsible for energy-related affairs, such as energy supply (petroleum and electricity) and top-level coordination of charging infrastructure planning and construction and the development of respective policies.

6. Ministry of Housing and Urban-Rural Development (MoHURD) - MoHURD is responsible for implementing policies related to the construction of charging infrastructure and facilities.

Figure 1: Responsibilities of departments for the promotion of urban buses in China



3. Overview on policies and subsidies for the promotion of New Energy Buses

Public transport in China is a social welfare. According to the Regulations on the Administration of Passenger Transport for City Buses and Trams (Decree No. 5, issued in 2017 by the MoT), a franchise model[6] shall be implemented in accordance with the Administrative Measures on the Licensing of Infrastructure and Public Utilities (Ordinance No. 25 issued on June 1, 2015 by NDRC, MoF, Ministry of Urban and Rural Construction, MoT, Ministry of Water Resources, People's Bank of China). The promotion of public transport and New Energy Buses shall be based on the principle of economy of scale and moderate competition, and factors such as capacity allocation, public demand, and public safety shall be comprehensively taken into account. With regard to buses, in general, the municipal public transport authorities select bus operators through service quality bidding, and the bus operators can purchase vehicles by public bidding through centralized government procurement.

3.1 New Energy Bus policies on national level

Since 2009, a comprehensive policy system which covers promotion and adoption, operation and purchasing subsidies, tax reduction, and safety supervision for New Energy Buses, has been established. This system is the foundation of the effective promotion of New Energy Buses in China. In particular, fiscal policies (purchasing, taxation and operations) have played an important role in the accelerated adoption of New Energy Buses.

6 "Franchise" means that the government authorizes legal persons or other organizations within and outside the People's Republic of China to use the means of competition to clarify rights and obligations and risk sharing through agreements, in order to invest into the construction of operational infrastructure and public utilities within a certain period of time to obtain benefits, and provide with public goods or public services.

Table 1: New Energy Buses key support policies in China since 2009

Category	Publishing Department	Policy
Promotion and adoption of New Energy Buses	MoT	Implementation Opinions on Accelerating the Promotion and Adoption of NEV in the Transportation Industry (2015)
		Opinions on comprehensively promoting the development of green transportation (2017)
	State Council	Implementation Opinions on Strengthening Ecological Environment Protection and Resolutely Fighting against and control Pollution (2018)
Subsidies for the purchasing of New Energy Buses	MoF, MoST	Notice on Carrying out Pilot Work on Demonstration and Promotion of Energy Saving and NEV (2009)
	MoF, MIIT, MoST, NDRC	Notice on Expanding Work on Energy Conservation and New Energy Vehicle Demonstration and Promotion in Public Service (2010)
		Notice on Expanding the Work of Demonstration and Promotion of Urban Hybrid Buses (2012)
Subsidies for the purchasing of New Energy Buses	MoF, MIIT, MoST, NDRC	Notice on continuing to promote the adoption of NEV (2013)
		Notice on Further Promoting the Adoption and Promotion of NEV (2014)
		Notice on the Financial Support Policy for the Promotion and Adoption of NEV in 2016-2020 (2016)
		Notice on Adjusting the Financial Subsidy Policy for the Promotion and Adoption of NEV (2016)
		Notice on Adjusting and Perfecting the Financial Subsidy Policy for the Promotion and Adoption of NEV (2018)
		Notice on Adjusting and Perfecting the Financial Subsidy Policy for the Promotion and Adoption of NEV (2019)
Subsidies for the operation of New Energy Buses	MoF, MoT, MITT	Notice on Improving the Policy on City Bus Gas Product Subsidiary and Accelerating the Promotion and Adoption of NEV (2015)
Tax incentives for New Energy Buses	MoF, General Tax Administration, MIIT, MoST	Announcement on Exemption of New Energy Vehicle Vehicle purchasing Tax (2017)
	MoF, General Tax Administration	Announcement on specific policies regarding vehicle purchasing tax (2019)
	MoF, General Tax Administration, MIIT, MoT	Notice on tax reduction for new energy vehicle and vessles. (2018)
	State Council	People's Republic of China Vehicle and Vessel Tax Law (2019 Amendment) (2019)

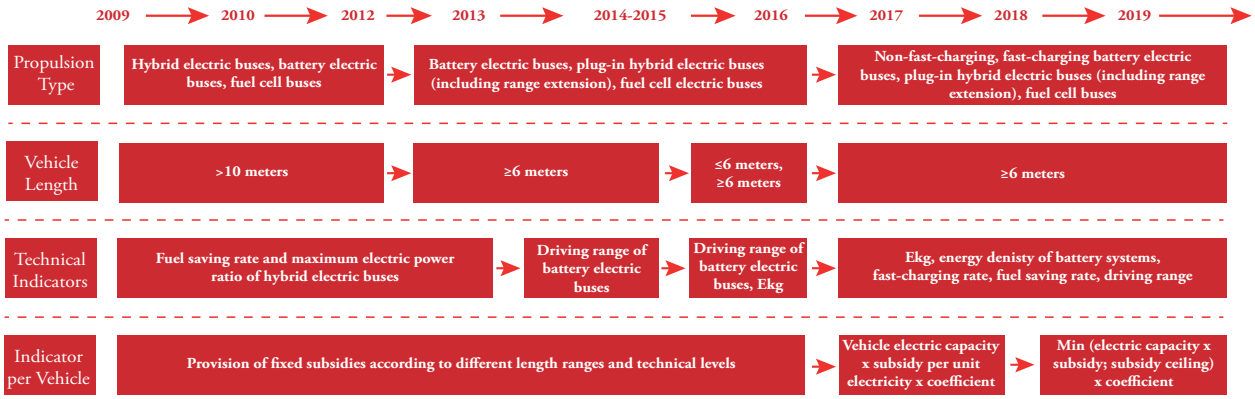
In terms of promotion, the MoT has accelerated the deployment of NEVs in the public service sector, and set targets and requirements for NEVs: by the end of 2020, within the area of Beijing, Tianjin and Hebei (Jing-Jin-Ji) and the surrounding areas, the Yangtze River Delta, and the Fenwei Plains (Fenhe Plain, Weihe Plain and their surroundings in the Yellow River Basins), all public buses in the provincial capital cities and pilot cities (Dalian, Qingdao, Ningbo, Xiamen and Shenzhen) are to be replaced with NEVs (including battery-electric, plug-in hybrid, and FCVs).

3.1.1 Purchasing subsidies for the promotion of New Energy Buses

Since 2009, MoF, MIIT, MoST and NDRC have implemented NEV purchasing subsidy policies, aiming at the improvement of relevant technical indicators such as range, energy consumption and battery energy density. The subsidies have since been reduced to eventually ensure the manufacturing of high-performance electric vehicle types. The specific requirements for vehicle purchasing subsidies in China are categorized as follows:

- Electric vehicle type (subsidies for hybrid-electric buses are not provided since 2013),
- Vehicle length (only buses of 6 meters length or longer are eligible for purchasing subsidies),
- Technical indicators (energy consumption per unit, density of battery system, range etc.),
- Subsidy basis (Previously a fixed amount of purchasing subsidies was provided for all vehicles, while since 2016, different amounts of subsidies are given based on different lengths of vehicles),

Figure 2: Major changes in policies on New Energy Bus purchasing subsidies 2009-2019



- Subsidy standard (in light of the manufacturing cost of batteries (e. g. the cost decreased from RMB 1,700 (EUR 223)/kWh in 2015 to RMB 1,300 (EUR 170)/kWh in 2018) and technological level (e. g. battery system energy density improved from 105watt-hours/kg to 170 watt-hours/kg in 2018), the amount of subsidies is lowered year by year from 2017 to 2020. Excepting for Fuel Cell vehicles, the subsidy amount for 2017-2018 was decreased by 20% against 2016 level, and for 2019-2020 the subsidy amount is decreased by 40%.

Figure 3a-e: Changes in purchasing subsidy policy for New Energy Bus purchasing 2009-2019 (Unit: RMB 10,000 per vehicle)

Figure 3a: Hybrid-electric bus

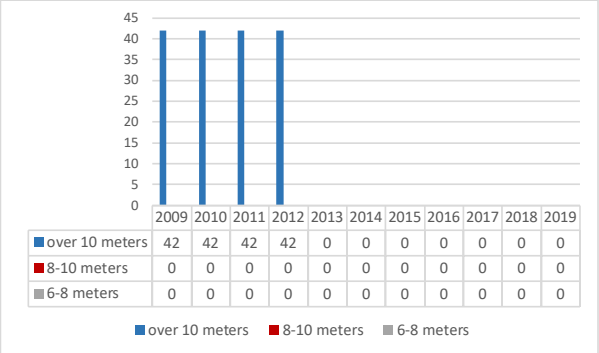


Figure 3b: Plug-in hybrid electric bus

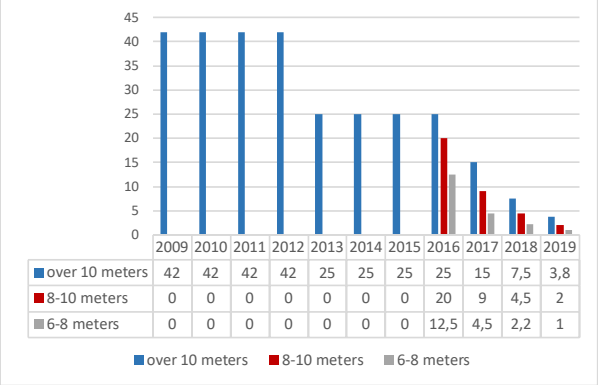


Figure 3c: Battery-electric bus

Figure 3d: Fast charging battery-electric bus

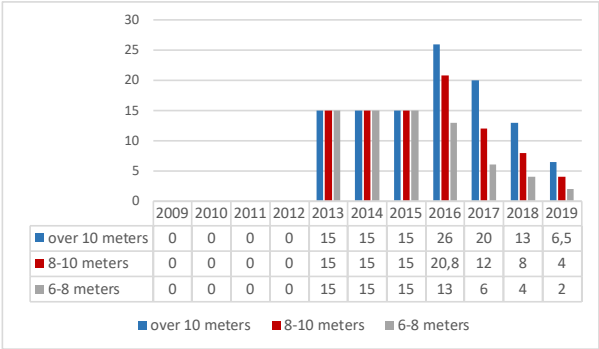
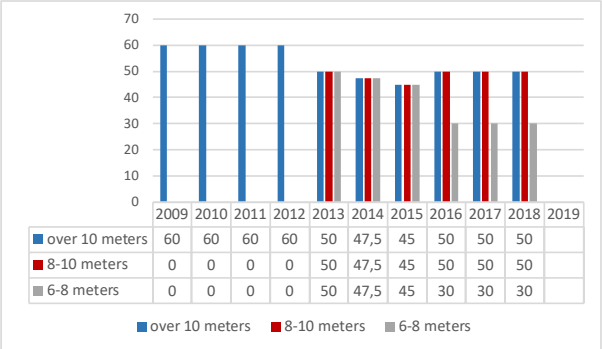


Figure 3e: Fuel cell electric bus



3.1.2 Operation subsidies for the promotion of New Energy Buses

MoF, MIIT and MoT provide annual operation subsidies for New Energy Buses that meet technical and operational requirements, and provide differentiated subsidy standards for buses of different lengths and power-charging types. With an eight-year general operation life-cycle of New Energy Buses, bus enterprises in China can obtain an operation subsidy of RMB 640,000 (EUR 83.858) for battery-electric buses with a length of more than 10 meters.

Table 2: Energy-saving and New Energy Buses operation subsidy standards (Unit: RMB 10,000 per vehicle / per year)

Propulsion type	Length (m)		
	6≤L<8	8≤L<10	L≥10
Battery-electric	4	6	8
Plug-in hybrid (with range extender)	2	3	4
Fuel cell	6		
Super capacitor, non-plug-in hybrid	2		

3.1.3 Tax incentives for the promotion of New Energy Buses

Urban buses enjoy purchasing tax and vehicle tax reduction. In terms of vehicle purchasing tax, in June 2012, the MoF issued the Notice on the Purchasing of NEV for Urban Public Transport Enterprises Exempted from Vehicle Purchasing Tax. The notice regulates that from January 1st, 2012 to December 31st, 2015, NEVs are exempted from the vehicle purchasing tax. In July 2016, the MoF and the State Administration of Taxation issued the same policy, which lasts from January 1st, 2016 to December 31st, 2020. The purchasing tax exemption policy has been officially written into the Vehicle Purchasing Tax Law which officially was adopted by the National People's Congress in 2018, and has been implemented since July 1st, 2019. If the average price of a New Energy Bus (battery-electric, plug-in hybrid and fuel cell) is RMB 850,000 (EUR 111,375), in 2018, the purchasing tax can be exempted by RMB 75,000 (EUR 9,827)[7]. According to the respective laws, local governments can provide regular tax reductions and exemptions for urban public transport vehicles of operators. The annual tax standard for each vehicle is RMB 480 (EUR 63) to RMB 1,440 (EUR 189).

3.1.4 Safety supervision

To ensure the safe operation of NEVs in the public sector, a national NEV monitoring platform[8] was set up to monitor vehicle information such as position data, failure alarm data, or battery extreme value data in real-time. MIIT released the Safety Technical Conditions for Electric Buses, which put higher requirements on the thermal runaway and thermal diffusion of batteries in order to ensure safe operation. For example, in terms of technical requirements and test methods, the rechargeable energy storage system is tested in accordance with the extended thermal runaway test conditions described in the Safety Technical Conditions for Electric Buses by MIIT. If thermal runaway occurs, but no fire or explosion occurs within 5 minutes after the signal is transmitted, and there is no smoke inside the passenger compartment, then it has passed the test.

3.2 New Energy Bus policies on provincial/municipal level

Local policies for the promotion of New Energy Buses in China mainly refer to financial subsidies, and charging infrastructure construction, focusing on the following aspects:

- Electric buses should account for a high proportion among all buses in central urban areas,
- Provincial and municipal governments continuously provide support to bus operators which apply for New Energy Bus acquisition subsidies,
- Provincial and municipal governments launch policies to accelerate the construction of charging infrastructure for New Energy Buses.

7 Vehicle purchasing tax = vehicle price / 1.13 * 0.1

8 The "New Energy Vehicle National Monitoring and Management Platform" (hereinafter referred to as "platform") is under the National Engineering Laboratory of Electric Vehicles of the Beijing Institute of Technology. The platform is the world's first national NEV monitoring and management platform. On the platform, vehicle information, location data, alarm data, and battery performance data can be monitored in real-time.

In general, policy support on municipal level led to the adoption of New Energy Buses in various cities such as Beijing, Shanghai, Nanjing, Guangzhou, Shenzhen, and Zhengzhou which can be considered as NEV champions.

3.2.1 Subsidies for the promotion of New Energy Buses

By 2020, only New Energy Buses shall be in operation in Beijing's central areas and sub-center areas. It is estimated that Shanghai has about 18,529 buses in operation[9]. By the end of 2020, all buses shall be replaced with New Energy Buses in the city's urban areas. In the Jiangsu province, the estimated total number of urban buses is 44,239. By 2020, New Energy Buses shall account for over 80% of the newly purchased and upgraded buses. Guangzhou has a fleet of 14,074 buses, all of which shall be New Energy Buses by the end of 2020.

Figure 4: 18-meter-long battery-electric bus in Beijing

Source: GIZ

Due to factors such as declining production costs, gradual expansion of market size, and accelerated technological development but also in order to promote the transformation of the NEV industry from a policy-driven towards market-oriented development, the central government's purchasing subsidies for New Energy Buses have gradually declined from 2016 and will be phased out after 2020.[10] At present, most cities still provide significant financial support for New Energy Bus purchasing in line with the requirements of the central government's subsidy policy[11]. In Beijing, the city-level subsidy for New Energy Buses given to buyers (e. g. bus companies) in 2018[12] was at the ratio of 1:0.5 between the central and local government. In the city of Nanjing, the local government provided purchasing subsidies of up to RMB 90,000 (EUR 11,793) for New Energy Buses (battery-electric, plug-in hybrid and fuel cell) in the period of 2018-2019. The municipal bus companies can directly apply for those subsidies from the municipal NEV promotion leading group office, which is established by local government authorities, aiming at promoting the adoption of NEV in the respective region. In the city of Shenzhen, the purchasing subsidy standard for each battery-electric bus in 2018 was up to RMB 90,000 (EUR 11,793). When selling NEVs, the manufacturers shall settle with the buyers according to the price after deduction of subsidies (when selling New Energy Buses to customers, the price should be the original price deducting the corresponding subsidies). The municipal Development and Reform Commission (DRC) and the relevant departments (related to the local subsidy issuance review mechanism which varies from place to place) in the NEV subsidy review pilot area (Shenzhen) allocate the subsidy funds to the bus manufacturers according to allocation procedures (manufacturers pay all costs at first, authorities subsidize them later).

In addition, some cities provide operation subsidies for New Energy Buses independently from national policies. For example, the city of Nanjing provides operation

9 Data collected before the end of 2016, 2017 city statistical yearbook

10 During the Executive Meeting of the State Council on March 31st, 2020, the Chinese government has decided to extend the current NEV purchasing subsidies to stimulate vehicle consumption in China, in particular against the impact of the COVID-19 outbreak on the automotive industry; details see chapter Outlook.

11 Subsidies are gradually declining, but in order to facilitate the promotion and adoption of New Energy Buses, most cities still provide significant financial support for New Energy Bus purchasing in line with the requirements of the central government subsidy policy.

12 Beijing's "Notice on Adjusting and Perfecting the Financial Subsidy Policy for the Promotion and Adoption of NEV in Beijing" was released in 2018.

subsidies for the adoption of NEVs by public transport enterprises. If their New Energy Bus operation cost is still higher than that of internal combustion engine buses after deducting the purchase subsidies, the depreciation cost of the New Energy Bus will be calculated differently and operation subsidy will be provided. Besides the purchasing subsidy, Shenzhen also provides differentiated operation subsidies for New Energy Buses with different purchasing years, and operation subsidies are linked to the annual operating mileage (the operation subsidy is related to the actual annual driving mileage).

3.2.2 Infrastructure

Some cities have introduced charging facility development plans to clarify the goals of charging pile and charging station construction for New Energy Buses and to ensure coordinated development. For example in Beijing, charging facilities are preferentially installed in bus depots and bus stops for New Energy Buses which usually operate on a fixed route. The Guangdong province has set the goal that 590 charging stations for buses and other public and special purpose vehicles will be in operation in the province by 2020. Nanjing plans by the end of 2020 to have 549 special bus charging stations at bus stations in operation, and the total number of charging piles will reach 5,407. The city of Zhengzhou plans to build 3 public battery swapping stations and 143 charging stations for battery-electric buses by 2020.

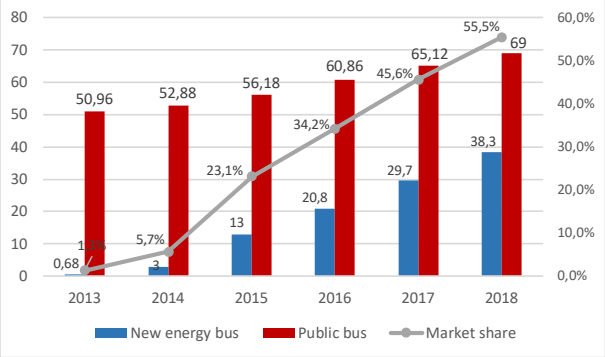
Table 3: New Energy Bus policies in Beijing, Shanghai, Nanjing, Guangzhou, Shenzhen, and Zhengzhou

City	Key Polices	Core Contents
Beijing	Notice on Adjusting and Improving the Financial Subsidy Policy for the Promotion and Adoption of NEVs in Beijing	City-level subsidies for NEVs will be provided (BEV, fuel cell vehicles) in accordance with the ratio of central and local governments 1:0.5
	Beijing three-year plan on defending the blue sky	By the year of 2020, Beijing allows only the use electric buses in both its central urban areas and sub-center areas.
	Implementation Opinions on Further Strengthening the Construction and Management of Electric Vehicle Charging Infrastructure	Support the use of electric vehicles in the city bus service, environmental sanitation service, airport commuting service, and build charging facilities in the respective parking lots.
Shanghai	Shanghai Clean Air Action Plan (2018-2022)	By the end of 2020, the adoption rate of New Energy Buses will be 100%.
	Implementation Opinions on Promoting the Adoption of Environmentally Friendly Buses Such as Energy Saving and New Energy (2013-2015)	From 2014 onwards, the proportion of environmental friendly buses such as New Energy Buses should be more than 60% among the newly added or updated buses, and the ratio of New Energy Buses should be no less than 30% of the newly added or upgraded ones. By 2017, the proportion of environmental friendly buses such as energy conservation and new energy will rise to 30%.
	Implementation Opinions on Promoting the Adoption of Environmentally Friendly Buses Such as Energy Saving and New Energy (2013-2015)	For battery-electric buses, hybrid buses, super-capacitor buses, plug-in hybrid electric buses (including extended-program), the corresponding standard subsidies will be given according to the national financial subsidy standards.
		For the increased operating costs of environmental friendly buses such as energy saving and New Energy Buses, the corresponding subsidies will be provided according to the 8-year bus operating cycle.
Nanjing	Rules for the Implementation of Financial Subsidies for the Promotion and Adoption of NEVs in Nanjing in 2018-2019	The total subsidy does not exceed 50% of the vehicle price after deducting state subsidies. In 2019, the subsidy standards for various types of vehicles will decrease by 20% on the basis of the 2018 standard.
	Improve the plan of financial subsidies for public transport enterprises	Due to the high cost of purchasing new energy buses, certain subsidies will be calculated separately for the depreciation expenses of ordinary buses after deducting the subsidies for purchasing.
	Nanjing 13th Five-Year Electric Vehicle Charging Infrastructure Planning	By the end of 2020, Nanjing plans to build 549 charging stations in bus stations (including 15 bus stations with 207 charging piles before the end of 2016), and the number of charging piles will reach 5,407.
Guangzhou	Suggestions on Guangdong to promote the New Energy Buses	In addition to FCVs, local subsidies will be granted to BEVs that meet the requirements in a ratio not exceeding the national subsidy of 1:0.5. Local subsidies are imposed on plug-in hybrid (including extended) vehicles at a rate not exceeding the national subsidy requirement of 1:0.3.
		In accordance with the principle of not increasing the comprehensive use cost of NEVs and vehicles in public transport and rental areas, the promotion and adoption of NEVs in the above-mentioned fields will be increased and demonstrated.
	Guangzhou Automobile Industry 2025 Strategic Planning	All around promotion of applying battery-electric buses
Shenzhen	Subsidies measures for New Energy Bus during the period of demonstration and promotion	The subsidy standard for each New Energy Bus purchasing by financial leasing before June 1, 2013 is RMB 260,000 per year. The subsidy standard for each New Energy Bus in operation after June 1, 2013 (including June 1) was RMB 422,700 per year.
		The operating subsidy standard for upgraded vehicles is determined according to the difference between the first two criteria and the amount of the individual vehicle subsidy within the financial quota of each bus franchise enterprise according to the upgrade time (updated the annual subsidy for individual vehicles = new vehicle annual subsidy for individual vehicles - annual subsidy for individual vehicles within the quota)
	Financial support policy for the promotion and adoption of NEVs in Shenzhen in 2018	The subsidy standard for each battery-electric bus is up to RMB 90,000.
Zhengzhou	Zhengzhou City accelerates the implementation of electric vehicle charging infrastructure construction (2017-2020)	By 2020, 3 public battery swap stations and 143 battery-electric bus charging stations will be built

3.3 Policy implementation effects

Since 2012, under the national NEV support policy system, the Compound Annual Growth Rate (CAGR) of production and sales of New Energy Buses has been more than doubled. In particular, purchasing subsidies, operation subsidies and the adjustment of the refined oil price subsidy policy in 2015 led to an uptake of the New Energy Bus industry and market and to an increased replacement of conventional combustion engine buses with New Energy Buses. In 2018, the sales volume of New Energy Buses exceeded 90,000. By the end of 2019, the total number of New Energy Buses in China reached about 400,000, and the proportion in the overall bus market has increased rapidly from about 1% in 2013 to more than 55% in 2019. The market penetration rate of New Energy Buses continuously increased over these six (2013-2019) years and will continue to increase in the future.

Figure 5: The total number of New Energy Buses in China from 2013 to 2018 (unit: 10,000 vehicles)



Source: Motor vehicle insurance data, Statistical Bulletin of the Development of Transportation Industry released by MoT annually.

According to statistics of the Ministry of Public Security, by the end of 2018, the total number of buses in the 10 key air pollution control areas and key provinces and cities (Beijing, Shanghai, Tianjin, Hebei, Hainan, Guangdong, Zhejiang, Shandong, Jiangsu, and Shanxi) accounted for more than 50% of the total number of buses in China. The average share of New Energy Buses in those provinces and cities is more than 50%. The total number of buses in the 9 central Chinese provinces Fujian, Jiangxi, Hunan, Hubei, Henan, Anhui, Shaanxi, Guangxi and Qinghai takes up 27% of the total number of buses in China. The average share of New Energy Buses in these areas has exceeded 40%. While buses in the other 12 Chinese provinces (Helongjiang, Jilin, Liaoning, Qinghai, Xinjiang, Tibet, Yunnan, Guizhou, Sichuan, Chongqing Municipality, Guangxi, Ningxia) take up 20% of the total number of buses in China, the average percentage of electric buses in these provinces has only exceeded 30%.

Table 4: The proportion of New Energy Buses and market share in major Chinese provinces

Area	Total buses	New Energy Buses	Market share
Beijing	28.050	9.773	35%
Tianjin	12.636	5.914	47%
Hebei	36.889	20.491	56%
Shanxi	18.098	10.268	57%
Inner Mongolia	12.723	4.495	35%
Liaoning	26.937	11.145	41%
Jilin	13.959	4.599	33%
Heilongjiang	23.468	9.416	40%
Shanghai	17.587	9.074	52%

Source: Ministry of Public Security

Conventional combustion engine buses are more emission intensive than New Energy Buses. Battery-electric buses consume only one-fourth of the energy of conventional combustion engine buses and reduce carbon emissions by around 30%–40% (well-to-wheel), thus having a positive impact on carbon emission reduction even in a fossil fuel-dominated grid.[13] According to CATARC, compared with conventional combustion engine buses that meet the national emission standard level 3 or lower[14], New Energy

13 Source: Sustainable Transport solutions - Low-Carbon Buses in the People's Republic of China, ADB, gef, November 2018

14 The national 3 standard is China's third-stage vehicle emission standard, which is equivalent to the European III emission standard. The difference is that new cars must be equipped with an OBD or vehicle self-diagnosis system.

Buses in China so far saved about 7.74 million tons of fuel oil per year and reduced NO emissions by about 62,000 tons. At the same time, PM emissions were reduced by about 14,000 tons/year, and carbon oxide emissions were reduced by about 83,000 tons/year. In particular the promotion of battery-electric buses, which account for a share of 93% of the total New Energy Bus fleet in China are contributing to more climate-friendly public transport.

4. Conventional combustion engine bus policies and impacts on New Energy Buses

4.1 Policies for conventional combustion engine buses

According to the China Motor Vehicle Environmental Management Annual Report published by the Ministry of Ecology and Environment (MEE), motor vehicles, especially diesel vehicles are the primary source of air pollution in many large and medium size Chinese cities. Reducing the number of diesel vehicles is an important measure to control air pollution. In order to effectively reduce traffic related air pollution and to improve the overall environmental quality, the central government has proposed development strategies such Opinions on Comprehensively Strengthening Ecological Environmental Protection and Resolutely Fighting Against Pollution in June, 2018 and the Three-Year Action Plan on Defending the Blue Sky in July 2018, aiming at speeding up the elimination of old diesel vehicles (old diesel vehicles are not further specified in the policies, but this term usually refers to vehicles with low emission standard and long duration of use). The phase out of conventional combustion engine buses is an integral part of this ambition.

As the NEV market continues to grow, the central government and local governments firstly accelerate the phase out of diesel vehicles and promote the adoption of NEVs in the public service sector including urban buses, and at the same time reduce the support for conventional combustion engine buses. In 2015, the MoF, the MIIT and the MoT jointly issued the Notice on Improving the Promotion of the Adoption of Urban Bus Refined Oil Price Subsidy Policy to Accelerate the Promotion and Adoption of NEV[15]. Since 2015, the fuel supply fund for conventional combustion engine buses has been rapidly reduced, and will continue to decline year by year, falling by 60% in 2019 against 2013 levels[16]; fuel subsidy will also be linked to the number of New Energy Buses, further curbing the growth of conventional combustion engine buses[17]. In addition, most Chinese provinces and municipalities have accelerated the implementation of national policy. For example, Guangdong, Shanxi, Liaoning, Shandong and other provinces will gradually reduce price subsidies for refined oil products of city buses, increase New Energy Bus operation subsidies, and actively explore the mechanism of restricting the growth of conventional combustion engine buses in the market, and encourage the promotion and adoption of New Energy Buses.

15 The general aim of the "Notice on improving the subsidy policy for the price of refined oil products of urban buses to accelerate the promotion and adoption of NEV" is to take into consideration the purchasing and operating costs of various types of urban buses, and on the premise that the overall level of subsidies to the urban bus industry is relatively stable, adjust and optimize the financial subsidy expenditure structure, balance the cost of using conventional combustion engine buses and new-energy buses, and gradually form a comparative advantage of NEVs.

16 The "Notice on improving the subsidy policy for the price of refined oil products of urban buses to accelerate the promotion and adoption of NEV" states that from 2015 to 2019, the amount of subsidies for the increased price of refined oil products would decrease year by year against the benchmark price of 2013 - 15% reduction in 2015, 30% reduction in 2016, 40% reduction in 2017, 50% reduction in 2018, and 60% reduction in 2019. In 2020 it is still to be determined based on the energy consumption structure of urban buses.

17 The oil price subsidy funds are linked to the number of New Energy Buses promoted. "Linking" refers to that the policy has made requirements to the percentage of newly added and upgraded New Energy Buses in key air pollution control and prevention provinces, central provinces and Fujian province respectively from 2015 to 2019. For those provinces that met the promotion ratio, the whole amount of the subsidies would be given. For those that didn't met the promotion ratio, only 80% of the subsidies would be given.

Some provinces and cities have provided certain subsidies for the decommission of old conventional combustion engine buses to accelerate their phase out from the market, which has facilitated the promotion and adoption of New Energy Buses to a certain extent. For example, in October 2018, the city of Shenzhen issued the "Shenzhen old-fashioned Vehicles early Decommission subsidy (2018-2020)", for the GB I (China's stage 1 limits and measurement methods for emissions from light-duty vehicles, equivalent to Euro I) and GB II (equivalent to Euro II) large and medium-sized petrol passenger vehicles and GB III (partially equivalent to Euro III) large medium-sized diesel passenger vehicles eliminated at different periods shall be subsidized. Already in December 2009, the city of Guangzhou issued the "Guangzhou City Encouraging the Elimination of Old-fashioned Combustion Engine Vehicles". If the bus owners chose to scrap the yellow-label vehicles (heavy-polluting vehicles) or transfer them out of Guangzhou to other areas where the yellow-label vehicles are allowed to be on the road and then purchase locally produced New Energy Buses, they would get a total of RMB 9,600 (EUR 1,258) subsidies from the central government and local government. The "Fuzhou New Energy Bus Replacement Plan" issued in November 2017, by city of Fuzhou (by the Fuzhou New Energy Bus Replacement Leading Group Office) says that for the buses that are scrapped in advance to their 10 years life-cycle, the municipal and county governments in Fuzhou (Fuzhou Finance Bureau, the Municipal Transport Commission, and the counties' governments) will subsidize each bus that is scrapped 0-1 year (deployment of the bus up to 1 year, referring to the yellow-labeled vehicles, buses operated for 1 year can also get same subsidy) ahead with RMB 29,000 (EUR 3,800), and RMB 35,000 (EUR 4,586) for each that is scrapped more than 1 year ahead.

Table 5: Shenzhen subsidy standard for scrapping large medium-sized passenger vehicle (Unit: RMB/Vehicle)

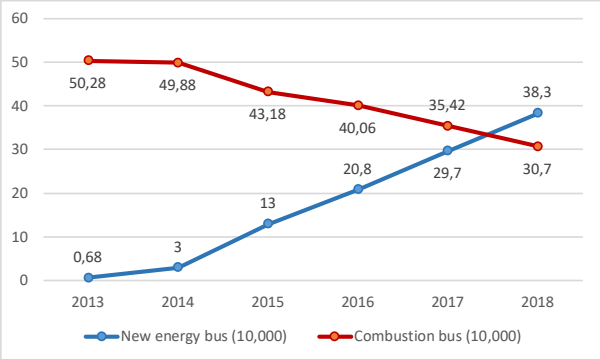
Vehicle type	Phase-out date	Subsidy standard
(RMB/vehicle)	07/01/18-12/31/18	9,000-17,000
GB II vehicle	07/01/18-06/30/20	12,600-25,000
GB III diesel vehicle	07/01/18-12/31/18	23,000-95,000
	01/01/19-06/30/19	20,700-85,500
	07/01/19-12/31/19	18,400-76,000
	01/01/20-06/30/20	16,100-66,500

4.2 Impacts of policies on New Energy Buses

Against the background of the transformation and upgrading of the automotive industry, both central and local governments have made policies to boost the competitive advantage of New Energy Buses to conventional combustion engine buses, and curbed the use of conventional combustion engine buses to a certain extent. The government also helps the bus manufacturers to increase investment into R&D and the production of New Energy Buses.

Since 2013, New Energy Buses have been used in a small-scale, and by the year of 2015, the number of New Energy Buses exceeded 130,000, which signalled a 3-fold increase compared to 2014. Between 2016 and 2018, the number of New Energy Buses increased by 33% year by year. At the same time, due to the replacement with New Energy Buses, the number of conventional combustion engine buses has significantly decreased since 2015, with an average annual decline of nearly 10%. In 2018, the number of New Energy Buses surpassed that of combustion engine buses by nearly 70,000. The internal combustion engine bus population is continuously declining and New Energy Bus vehicle population is continuously increasing as can be seen in Figure 6.

Figure 6: Development of the total number of combustion engine buses and New Energy Buses in China (Unit: 10,000)



5. Fuel cell electric bus policies

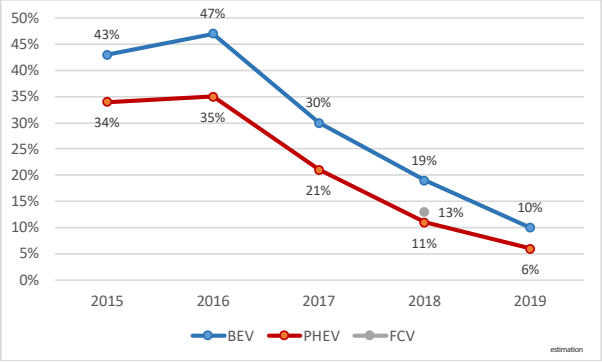
5.1 Impacts of policies on fuel cell electric buses

Until 2016, battery-electric bus purchasing subsidies accounted for more than 40% of the vehicle selling price. This governmental fiscal support was key to R&D, production and overall industry and market uptake. As shown before, even though, after 2016, China's New Energy Bus purchasing subsidies have gradually declined, compared to plug-in hybrid bus and fuel cell electric bus purchasing subsidies, the purchasing subsidies for battery-electric buses are still much higher. The central government, the State Council, also proposed higher requirements, such as in its Three Year Action Plan of the Blue Sky Protection Campaign issued in 2018, for the promotion of NEVs in areas such as public transport, taxi, postal services and urban distribution, leading to the nation-wide adoption of battery-electric buses. Plug-in hybrid electric buses have certain market demand in high altitude and cold areas (due to range advantages), but the annual market scale (sales volume) is only several thousand units. However, due to insufficient policy support for fuel cell electric buses at the beginning of the New Energy Bus promotion in China (compared e. g. to the promotion of battery-electric buses), the respective fuel cell electric bus industry and market both lack of vitality.

Based on industry surveys and expert consultation, it is estimated that the cost of fuel cell electric buses in China is 60%-80% higher than that of battery-electric buses. In terms of purchasing subsidies, the ratio of subsidies to the purchasing price of fuel cell electric buses is less than that of battery-electric buses, which makes fuel cell electric buses even less cost competitive in the overall market.

The fuel cell electric bus industry and the FCV industry in general in China are still facing various problems. Among them are inadequate core technologies (performance and reliability of key materials such as catalysts, carbon paper, proton exchange membranes PEM, and membrane electrodes and key auxiliary components such as air compressors, hydrogen circulation pumps, and humidifiers) which are far from advanced levels. Most of the key materials, auxiliary products and components still need to be imported, leading to high purchasing cost and poor overall economic performance. Also various difficulties in producing, transporting and refilling hydrogen are existing. Overall, the FCV industry is still at the initial stage of pilot operation and only slowly makes development progress.

Figure 7: Ratio of New Energy Bus purchasing subsidies for different vehicle types to selling prices from 2015 to 2019



Note: Fuel cell electric buses have not been widely applied. The subsidy standard for fuel cell electric bus purchasing is still not yet set.

5.2 Development trends of fuel cell electric buses

FCV promotion has become a major strategic direction as part of the global transport, energy and power sector transition. China also attaches great importance to the development of the FCV industry. In 2019, the policy support system was adjusted and pilot demonstration projects were launched to inspire and encourage both the local governments and enterprises to promote FCVs (the central government may launch pilot demonstration projects to accelerate the development of the FCV industry and at the same time will motivate local governments and enterprises to develop FCVs and respective industry chains). The promotion, planning and construction of hydrogen refueling stations (HRS) takes time, and it is difficult to achieve a significant reduction of costs of FCVs in the next few years. In addition there are regulatory hurdles for the transportation of hydrogen among others. In the recent and upcoming years, it were and will be mainly urban buses (mainly 12-meter buses as typical fuel cell bus study vehicle) which, with fixed operating routes and controllable mileage, are subject of pilot demonstration projects and programmes (e. g. in Beijing, Foshan, Suzhou, Zhangjiakou).

Mainly restricted by the scale of the hydrogen fuel cell electric industry and suitable (green) hydrogen supply, China's FCV industry is still facing various challenges and technological bottlenecks as mentioned before. According to the overall macro trend, it is still difficult to achieve large-scale adoption of FCVs in the near term. It is expected that small-scale demonstration and adoption of such vehicles in key areas will be realized by 2020. After 2030, with the upgrade of technology and hydrogen refueling facilities, and the reduction of manufacturing costs, the large-scale promotion of fuel cell electric buses is more likely to be realized. Commercial buses are expected to be a breakthrough point in the industrialization of hydrogen FCVs (early adoption will also take place in the fields of urban logistics vehicles, medium and heavy goods vehicles). Fuel cell electric buses are still in a small-scale demonstration phase in the near term but the number of vehicles will increase in the next 10 years. According to the publication "Technology Roadmap for Energy Saving and NEV" issued by the China Society of Automotive Engineers, the number of China's FCVs will reach 5,000 (60% commercial vehicles and 40% passenger vehicles), 50,000 (20% commercial vehicles and 80% passenger vehicles) and 1 million respectively in 2020, 2025 and 2030. With their advantages of short refilling time, long range and good loading capacity, hydrogen fuel cell electric buses are suitable for inter-city long-distance operation. Meanwhile, fuel cell electric buses will be firstly used in areas with abundant hydrogen energy resources and relatively complete infrastructure of hydrogen refueling stations, such as Shanghai, Guangdong, Jiangsu, Zhejiang, Beijing, Tianjin and Hebei.

6. Summary & outlook

The New Energy Bus vehicle population in China is continuously growing, and the share of New Energy buses in the total bus vehicle fleet has already reached 55% in 2019. From 2016 to 2018, the sales volume of New Energy Buses in China was 78,000, 89,000 and 86,000 respectively and will hit the 100,000 mark in 2020. With the continuous governmental promotion of electro-mobility, support and incentive policies and non-fiscal support measures, the adoption of New Energy Buses will continue to rise rapidly and with the further advancement of bus and battery technology, New Energy Buses will become more cost competitive. In recent years, the sales volumes of conventional combustion engine buses declined and many old buses have been replaced with New Energy Buses. This trend will continue, even though manufacturers still have to overcome obstacles such as

high manufacturing costs and partly lacking technology. Even though, with comparably high Total Cost of Ownership (TCO), due to policy support, battery-electric buses have become the mainstream in the New Energy Bus market and similar to the overall development of NEVs, BEVs will become the major component of the urban bus market in China. Battery-electric buses are a central element of the strategy to achieve sustainable and low carbon transport, and as mentioned before, even in a fossil fuel dominated grid, significantly contribute to the reduction of carbon emissions. In 2016, the sales volume of battery-electric buses was 60,875, increasing to 73,484 and 83,020 in 2017 and 2019, respectively. The proportion of battery-electric buses to the total number of New Energy Buses increased from 78% in 2016 to 93% in 2018. The sales volumes of plug-in hybrid buses continued to decline in the past three years, from 17,215 vehicles sold in 2016 to 6,791 vehicles in 2019, mainly procured to meet the needs of a small number of special urban bus routes.

Figure 8: Sales distribution of New Energy Buses of different vehicle types from 2016 to 2018

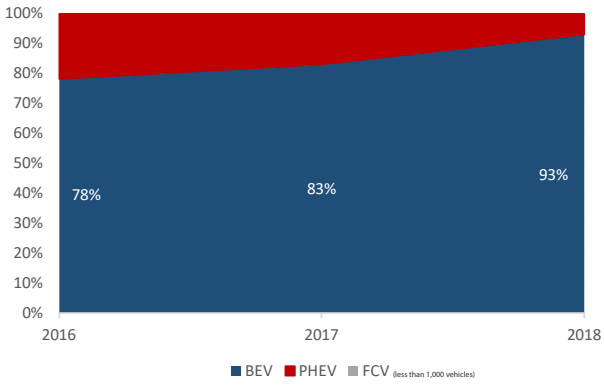


Table 6: Sales distribution of New Energy Buses in 2016-2022 (Unit: vehicle)

Year	Battery-electric	Plug-in hybrid	Fuel cell electric	Total
2013	2.638	2.987	0	5.625
2014	5.200	8.575	0	13.775
2015	33.697	12.907	0	46.604
2016	60.857	17.215	24	78.096
2017	73.484	15.557	4	89.045
2018	79.741	6.013	279	86.033
2019	83.020	6.791	554	90.365
Total	338.637	70.045	861	409.543
2020 (forecast)	96.857	7.923	646	105.425
2021 (forecast)	88.725	8.972	1.994	99.691
2022 (forecast)	93.933	10.674	2.135	106.742

Fuel cell electric buses are currently only operating at a small demonstration scale and a large scale uptake in a short period of time is not possible due to technological hurdles, regulatory barriers, high costs and overall lack of suitable hydrogen storage, transport and refueling infrastructure. Nevertheless, fuel cell electric buses will be important drivers of overall FCV uptake and large-scale commercialisation in the near term, in particular in the framework of pilot project implementation. Fuel cell electric buses can complement vehicle fleet composition in specific cases but most likely will mainly be applied in inter-city transport. In any case, if fuel cell electric buses shall contribute to the climate-friendly development of the transport sector, green hydrogen produced by electrolysis from renewable energy sources must be used.

In order to achieve the goal of carbon dioxide emission peaking by 2030 and making best efforts to peak earlier, as stated in China's Nationally Determined Contributions (NDCs) to the Paris Agreement, China must actively promote the "green revolution" in the transport sector. Against the background of the phase out of subsidies for the purchasing of NEVs at the end of 2022 (during the Executive Meeting of the State Council on March 31st, 2020, the Chinese government has decided to extend the

current purchasing subsidies which were planned to be phased out on December 31, 2020), for the operation of NEVs (until the end of 2019), and for the construction of NEV charging facilities (until the end of 2020), the further promotion of New Energy Buses will face high cost and operational pressure, and in particular will cause high financial pressure to local governments. Therefore, the promotion and adoption of New Energy Buses will still depend on policy support. Three key areas are of special importance for achieving the transition from a subsidy-based towards more market oriented development, for further accelerating the sustainable promotion and adoption of New Energy Buses in China and for increasing overall system efficiency:

1. Energy sector

Deepening the reform of the energy sector, increase the share of renewable energy in the overall energy mix, strengthening comprehensive and strategic planning of transport related energy conservation and environmental protection, improve transport sector-related energy conservation and emission reduction standards and regulations.

2. Promotion and adoption of NEVs

Provide top-level strategies, planning and clear requirements for the adoption and promotion of New Energy Buses (battery-electric, plug-in hybrid, and fuel cell electric), accelerate R&D, introduce new energy commercial vehicle credit policies, rational optimize bus system configuration (e. g. vehicle selection, charging and service infrastructure configuration and planning), optimize New Energy Bus route planning, improve maintenance and service levels, arrange special incentive funds by local governments such as subsidies for replacement of conventional combustion engine buses with New Energy Buses, provision of "green" electricity at a cheaper price, continue the provision of operation subsidies according to the operating mileage.

3. Charging infrastructure planning and construction Guarantee land supply and better integration of bus station construction projects into urban infrastructure construction, accelerate the construction of charging facilities, accelerate the construction and improvement of existing charging and battery swapping facilities for existing urban bus stations and future bus terminals and depots, further improve rewarding and subsidy policy for charging facilities.

During the Executive Meeting of the State Council on March 31st, 2020, the Chinese government has decided to extend the current NEV purchasing subsidies (which were planned to phase out by December 31, 2020) and tax exemptions to stimulate vehicle consumption in China. This came at a time, where the Chinese (and international) automotive industry is under immense pressure due to the COVID-19 epidemic and the downturn of the industry and in particular NEV production and sales. In the near term, the decision of the State Council Executive Meeting can be understood as a stabilization of the automotive industry, in particular against the background of the COVID-19 outbreak and the related market downturn. The decision can also be understood as a strong signal to OEMs and consumers and a reinforcement of the commitment of the central government to further support the promotion of NEVs and thus New Energy Buses. In the medium-to long run (at least until the end of 2022), it can be expected that the incentive policies and in particular subsidy schemes will be further adjusted (e. g. technical indicators and parameters end eligibility specifics) in order to stabilize the NEV industry and at the same time push market-driven technological advanced development, and to further reduce market distortion and system inefficiency (e. g. large vehicle fleet size and underutilization of vehicles due to high purchasing subsidies).

8. Annex

(1) Notice on Carrying out Pilot Work on Demonstration and Promotion of Energy Saving and NEV
(Cai Jian [2009] No. 6)

(2) Notice on Expanding the Work of Demonstration and Promotion of Energy Saving and NEV in the Public Service Sector (Cai Jian [2010] No. 227), Unit: RMB 10,000 / vehicle

Energy saving and NEV types	Fuel saving rate	Lead acid batteries for hybrid power system	Nickel-metal hydride batteries, lithium-ion batteries / super capacitors for hybrid power system	
			Maximum electric power ratio 20%-50%	Maximum electric power ratio > 50%
Hybrid power vehicles	10%-20%	5	20	--
	20%-30%	7	25	30
	30%-40%	8	30	36
	> 40%	——	35	42
BEV	100%	——	——	50
Fuel cell electric buses	100%	——	——	60

(3) Notice on Expanding the Work of Demonstration and Promotion of Bus Buses in Hybrid Cities (Cai Jian [2012]No. 633), Unit: RMB 10,000 / vehicle

Energy saving and NEV types	Fuel saving rate	Lead acid batteries for hybrid power system	Nickel-metal hydride batteries, lithium-ionbatteries/supercapacitors for hybrid power system	
			Maximumelectric power ratio 20%-50%	Maximum electric power ratio > 50%
Hybrid power vehicles	10%-20%	5	20	——
	20%-30%	7	25	30
	30%-40%	8	30	36
	> 40%	——	35	42

(4) Notice on Continued Promotion and Adoption of NEV (Cai Jian [2013] No. 551), Unit: RMB 10,000 / vehicle

Bus type	Vehicle length L (meter)		
	6≤L<8	8≤L<10	L≥10
Battery-electric bus	30	40	50
Plug-in hybrid bus (including extended-speed bus)	/		25
Fuel cell electric bus	50		

In addition: super capacitors, lithium titanate fast charging battery-electric bus will be subsidized with a fix subsidy of RMB 150,000 (EUR 19,654).

(5) Notice on Further Promoting the Adoption and Promotion of NEV (Cai Jian [2014] No. 11), Unit: RMB 10,000 /vehicle

Bus type	Vehicle length L (meter)		
	6≤L<8	8≤L<10	L≥10
Battery-electric bus	30	40	50
Plug-in hybrid bus (including extended-speed bus)	/		25
Fuel cell electric bus	47.5		

In addition: super capacitors, lithium titanate fast charging battery-electric bus will be subsidized with a fix subsidy of RMB 150,000.

(6) Notice on the Financial Support Policy for the Promotion and Adoption of NEV in 2016-2020

(Cai Jian [2015] No. 134), Unit: RMB 10,000 / vehicle

Bus type	Unit mass energy consumption (Ekg, Wh/km·kg)	Standard vehicle (10meters<vehicle length ≤12meters) Battery-electric driving range R (equal speed method, kilometers)					
		6≤R<20	20≤R<50	50≤R<100	100≤R<150	150≤R<250	R≥250
Battery-electric bus	Ekg<0.25	22	26	30	35	42	50
	0.25≤Ekg<0.35	20	24	28	32	38	46
	0.35≤Ekg<0.5	18	22	24	28	34	42
	0.5≤Ekg<0.6	16	18	20	25	30	36
	0.6≤Ekg<0.7	12	14	16	20	24	30
Plug-in hybrid bus (including extended-speed bus)		/	/	20	23	25	
Light fuel cell electric buses		30					
Medium and large fuel cell electric buses		50					

Note: the above subsidy standard takes the bus with the length of 10 meters to 12 meters as reference, subsidy standards for other lengths of battery-electric bus are sorted according to the above table's unit mass energy consumption and battery-electric driving range. Vehicles shorter than 6 meters will be given 20% of the standard subsidy. Vehicle ranges above 6 meters to 8 meters will be given 50% of the standard subsidy. Vehicle longer than 8 meters but shorter than 10 meters will be given 80% of the standard subsidy, and vehicle above 12 meters or with double layer will be subsidized by 1.2 times of the standard amount.

(7) Notice on Adjusting the Financial Subsidy Policy for the Promotion and Adoption of NEV

(Cai Jian [2016] No. 958), Unit: RMB 10,000 / vehicle

Vehicle Type	Central government subsidy standard (RMB/kWh)	Central government financial subsidy adjustment factor			Central government's max subsidy for individual vehicle (RMB10,000)			Local financial subsidy for each vehicle
					6<L≤8m	8<L≤10m	L>10m	
Non-super charging battery-electric bus	1,800	System energy density (Wh/kg)			9	20	30	Not more than 50% of the central government's subsidy for each vehicle
		85-95 (inclusive)	95-115 (inclusive)	> 115				
		0.8	1	1.2				
Super charging battery-electric bus	3,000	Fast charge ratio			6	12	20	
		3C-5C (inclusive)	5C-15C (inclusive)	>15C				
		0.8	1	1.4				
Plug-in hybrid (including extended-range) vehicle	3,000	Fuel saving rate			4.5	9	15	
		40%-45% (inclusive)	45%-60% (inclusive)	> 60%				
		0.8	1	1.2				
Light fuel cell electric buses	——				30			
Medium and large fuel cell electric buses	——				50			

(8) Notice on Adjusting and Improving the Financial Subsidy Policy for the Promotion and Adoption of NEV (Cai Jian [2018] No. 18), Unit: RMB 10,000 / vehicle

<table>
<tr><th rowspan="2">Vehicle Type</th><th rowspan="2">Central Government's Financial Subsidy Standard (RMB/kWh)</th><th rowspan="2">Central government's financial subsidy adjustment factor</th><th colspan="3">Central government's max financial subsidy for individual vehicle</th></tr>
<tr><th>6<L≤8m</th><th>8<L≤10m</th><th>L>10m</th></tr>
<tr><td rowspan="3">Non-super charging battery-electric bus</td><td rowspan="3">1,200</td><td colspan="3">System energy density (Wh/kg)</td><td rowspan="3">5.5</td><td rowspan="3">12</td><td rowspan="3">18</td></tr>
<tr><td colspan="2">115-135 (inclusive)</td><td>> 135</td></tr>
<tr><td colspan="2">1</td><td>1.1</td></tr>
<tr><td rowspan="3">Super charging battery-electric bus</td><td rowspan="3">2,100</td><td colspan="3">Fast charge ratio</td><td rowspan="3">4</td><td rowspan="3">8</td><td rowspan="3">13</td></tr>
<tr><td>3C-5C (inclusive)</td><td>5C-15C (inclusive)</td><td>> 15C</td></tr>
<tr><td>0.8</td><td>1</td><td>1.1</td></tr>
<tr><td rowspan="3">Plug-in hybrid (including extended-range) vehicle</td><td rowspan="3">1,500</td><td colspan="3">Fuel saving rate</td><td rowspan="3">2.2</td><td rowspan="3">4.5</td><td rowspan="3">7.5</td></tr>
<tr><td>60%-65% (inclusive)</td><td>65%-70% (inclusive)</td><td>> 70%</td></tr>
<tr><td>0.8</td><td>1</td><td>1.1</td></tr>
<tr><td>Light bus</td><td colspan="3">——</td><td colspan="3">30</td></tr>
<tr><td>Medium and large bus</td><td colspan="3">——</td><td colspan="3">50</td></tr>
<tr><td colspan="7">Single vehicle subsidy amount = Min{Vehicle power consumption × unit power subsidy standard; single vehicle subsidy limit} × adjustment coefficient (including: battery system energy density coefficient, unit load mass energy consumption coefficient, fast charge rate coefficient, fuel saving rate coefficient)</td></tr>
</table>

(9) Notice on Further Improving the Financial Subsidy Policy for the Promotion and Adoption of NEV (Cai Jian [2019] No. 138), Unit: RMB 10,000 / vehicle

<table>
<tr><th rowspan="2">Vehicle Type</th><th rowspan="2">Central Government's Financial Subsidy Standard (RMB/kWh)</th><th rowspan="2">Central government's financial subsidy adjustment factor</th><th colspan="3">Central government's max financial subsidy for individual vehicle</th></tr>
<tr><th>6<L≤8m</th><th>8<L≤10m</th><th>L>10m</th></tr>
<tr><td rowspan="3">Non-super charging battery-electric bus</td><td rowspan="3">500</td><td colspan="3">Unit mass energy consumption (Wh/km·kg)</td><td rowspan="3">2.5</td><td rowspan="3">5.5</td><td rowspan="3">9</td></tr>
<tr><td>0.19 (inclusive) - 0.17</td><td>0.17 (inclusive) - 0.15</td><td>0.15 and below</td></tr>
<tr><td>0.8</td><td>0.9</td><td>1</td></tr>
<tr><td rowspan="3">Fast charging and battery-electric bus</td><td rowspan="3">900</td><td colspan="3">Fast charge ratio</td><td rowspan="3">2</td><td rowspan="3">4</td><td rowspan="3">6.5</td></tr>
<tr><td>3C-5C (inclusive)</td><td>5C-15C (inclusive)</td><td>> 15C</td></tr>
<tr><td>0.8</td><td>0.9</td><td>1</td></tr>
<tr><td rowspan="3">Plug-in hybrid (including extended-range) vehicle</td><td rowspan="3">600</td><td colspan="3">Fuel saving rate</td><td rowspan="3">1</td><td rowspan="3">2</td><td rowspan="3">3.8</td></tr>
<tr><td>60%-65% (inclusive)</td><td>65%-70% (inclusive)</td><td>> 70%</td></tr>
<tr><td>0.8</td><td>1</td><td>1,1</td></tr>
<tr><td colspan="7">Single vehicle subsidy amount = Min {Vehicle power consumption × unit power subsidy standard; single vehicle subsidy limit} × adjustment coefficient (including: battery system energy density coefficient, unit load mass energy consumption coefficient, fast charge rate coefficient, fuel saving rate coefficient)</td></tr>
</table>

7. References

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