

Electric bike market and regulation in mainland of China
 The technical service center of Electric Vehicle Institute of China Electrotechnical
 Society
 Guo Zi-qiang

Abstract: This paper introduces the electric bike market and regulations in mainland of China. The electric bike development in mainland of China is supported by center and local governments, and it is suitable for the situation of electric vehicle in the world and for china national condition. Electric bike is a green personal traffic transportation. There are many advantages for electric bike, such as: non-pollution, saving labor, safety, convenience. So the electric bike market in mainland of China is very large. Quantities of production and marketing in 1997, 1998, 1999 are 15, 54.5, 148 thousands, in 2000, 2001, 2002 will be 240, 300, 500 thousands. There are some problems to be solved, the quality and service should be improved. The electric bike market in mainland of China will be developed more quickly and larger.

1 Why develop electric bike?

1.1 All countries in the world are actively developing electric vehicle

All countries in the world are actively developing electric vehicle because:

1) The oil resource is vital, but becoming close to exhaustion [1, 2].

In recent and past several oil crisis, the increase of oil price all caused turbulence in the world economy.

As reported, the global oil consumption in 1993 was 6,670 barrels/day, while the total oil reserve in 1994 was 99 million barrels. Based on the consumption, the reserve will be used up in 42 years.

The oil consumption in automobiles is about 50% of the global consumption.

2) Highly effective use of various primary energies

By using oil in automobiles, the energy efficiency is 10-12%. By charging storage batteries through oil power generation and activating electric vehicle with the storage batteries, the energy efficiency can reach 18-21%. (Energy efficiency is increased over 50%.)

Electric vehicle can various primary energies to generate electric power, thereby reducing reliance on oil.

Electric vehicle can use the electric power during the off-peak of power stations. This helps load balance and energy saving.

3) Protecting environments and reducing air pollution

Automobiles are the main emission sources of air pollutants. (See Table 1)

The emission of hazardous gases from fuel-assist vehicles is 2-4 times higher than that from automobiles and such vehicles are about 20% of motors. (See Table 1)

4) Reducing noise

Table 1 Emissions of hazardous gasses from automobiles and fuel-assist vehicles

	NO _x	CO	VOC	PM	SO _x	CO ₂
% of air pollutants emitted from automobiles in the survey of EPA, USA	38	63	34	23		

% of air pollutants emitted from automobiles in Tokyo, Japan	50					16
% of air pollutants emitted from automobiles in downtown Tokyo, Japan	78					20
% of air pollutants emitted from automobiles in Shanghai, China	56	86	96			20
Emission of pollutants from automobiles (g/KM)	1.6	20.4	2.9	19.52	0.011	
Emission of pollutants from fuel-assist vehicles (g/KM)	0.056	11.78	4.57	44.48	0.024	

1.2 China first develops electric bike in the electric vehicle development.

- 1) Determined by China national condition – China is a developing country with limited economic strength, where people have limited economic ability and roads have limited capacity. A considerable progress is required before automobiles enter family lives.
- 2) Personal transportation is a necessary supplement to macro transportation (railway and public transportation) and remains essential.
- 3) There are many favorable conditions for the electric bike development.
 - a. Good foundation: China is a bike kingdom with the world’s largest number of bike possession, where bike is a common and habitual means of transportation.

Electric bike is close to bike, thereby easy to be accepted. We can say that “as long as there is a bike market, there is a market for electric bike.”

- b. The electric bike technique is more mature, with not only constantly improving performance, but also the advantages such as compactness, energy saving, rapidness, safety and small footage.
- c. The price is acceptable. RMB2000-3000/unit meets people’s consumption level.
- d. It complies with China’s national environment policy and is a zero-emission green transportation tool.
- e. As permitted by the policy, it is no problem to obtain licenses.

2 National and governmental appreciation and policies on the electric bike development

2.1 The nation supporting the electric bike development

In 1987, Electric Vehicle Institute of China Electrotechnical Society was founded.

In December 1991, National Science Board (國家科委) named the electric bike development as one of the ten technology projects and still deemed electric bike as a major item of technology projects during the “95” period.

In 1994, National Defense Science and Technology Committee (國防科工委) and National Defense Department of USA signed a collaboration agreement of military privatization, in which the promotion and application of electric vehicle was one of the items for collaboration.

In 1995, Prime Minister Li Pong and Vice Prime Ministers Li Lan-Qing, Wu Bang-Guo, Tai Jia-Hua successively made important comments on the development of electric vehicle business. Based on the direction of the comments, Mechanical Industry Department (機械工業部) held Seminar for Electric Vehicle Development Strategy together with National Science Board (國家科委)

and Economy and Trade Committee (經貿委) in October 1995. Whereas, Light Industry General Society (輕工業總會) held Seminar for Electric Bike Development.

In April 1999, China held the meeting “Clean Air Program – Clean Automobile Action” in Beijing. Vice Prime Minister Wu Bang-Guo attended the meeting and made an important speech. Thereby, China founded the Coordination and Leading Team for Clean Automobile Action.

In October 1999, the 16th International Electric Vehicle Meeting took place in Beijing. Both Vice Prime Minister Wu Bang-Guo and Deputy Director of Technology Department Xu Guan-Hua made speeches in the meeting.

In 2000, administrative coordinators (政協) nationwide returned to Department of State (國務院) to actively recommend the promotion and application of electric bike.

In July 2000, Legislation Office (法制辦公室) under Department of State and Traffic Control Bureau (交通管理局) under Police Department heard the comprehensive reports by China Bike Association on the status of electric bike for the stipulation in “Road Traffic Road (Draft)”. It is basically agreed that the speed shall be no more than 20KM/h and electric bike with the pedaling function can be treated as non-motor vehicle.

2.2 Local governments concerned about the electric vehicle development

In 1993, Hubei Province founded the Leading Team for the electric vehicle development.

Guangdong Province founded the Leading Team for the category of electric car.

Shanghai Municipal External Economy and Trade Committee (上海市經委) founded Electric Vehicle Industrialization Development Center.

In 2000, Shanghai Municipal founded Green Industry Promotion Commission.

In 2000, Zhejiang Province founded Electric Vehicle Preparatory Team.

2.3 Local governments restrict fuel-assist vehicle and appreciate the electric bike development.

Beijing Municipal explicitly bans the sales and driving of fuel-assist vehicle.

Tianjin, Guangzhou, Hangzhou also ban the sales and driving of fuel-assist vehicle.

Nanjing Municipal has refused license grant to fuel-assist vehicle since July 1 1996.

In March 2000, it performed annual inspection of fuel-assist vehicle and compulsorily eliminated those of which the exhaust gas emission was unacceptable. In the first annual inspection, 10,000 out of 32,000 units were eliminated.

Shanghai Municipal has suspended license grant to fuel-assist vehicle downtown since July 11 1996. On December 25 1996, Major Xu Kuang-Di of Shanghai made it clear “to gradually eliminate petroleum-assist vehicle and actively develop and promote electro-assist vehicle.” Later, the municipal government announced the policy of “control over total number, gradual replacement, strict management and stable transition” as well as the measure to collect emission pollution fees for petroleum-assist vehicle. In 1999, it performed annual inspection for fuel-assist vehicle and compulsorily eliminated those of which the exhaust gas emission was unacceptable. In the first annual inspection, 53,000 units were eliminated. It is expected to eliminate 100,000 units per year in future. In April 1999, Major Xu Kuang-Di further stressed, “The city is prepared to gradually replace fuel-assist vehicle with electric bike in the next 4-5 years.” Shanghai Municipal External

Economy and Trade Committee (上海市經委) listed electric bike as one of the 12 f construction products in the “Highland”.

In cities like Shanghai, Tianjin and provinces like Jiansu, Zhejiang, Guangdong, Cichang, Yunnan, Anhui, Hebei, license grant to electric bike is already permitted.

2.4 Establishing related standards for stable and healthy electric bike development

In 1997, Shanghai Municipal established local standards for the whole electric bike, generator, storage battery and charger etc.

In 1997, China Light Industry General Society (中國輕工業總會) established industrial standards “Electric Bike Generic Technical Conditions” (GB 2302-1997).

In 1997, China Light Industry General Society (中國輕工業總會) established “Implementation Rules for Bike Production Permit”, which includes electric bike in the range of control.

In 1999, national standards “Electric Bike Generic Technical Conditions” (GB 17761-1999) were established based on this.

In 2000, Zhejiang Province established local standards “Storage Battery Exclusive for Electro-Assist Vehicle” (Draft).

In 2000, national standards for storage battery for electric bike (draft) were established.

2.5 Actively promoting electric bike

From 1997 to 2000, China Bicycle Association (中國自行車協會) held National Electric Bike Mileage Competition every year and the results were gradually improving.

From 1996 to 2000, Electric Vehicle Institute of China Electrotechnical Society held one national light electric vehicle meeting.

In 1998 and 1999, Electric Vehicle Institute of China Electrotechnical Society held the first and second International Power Battery Exhibition. In 2000, Shanghai hosted the first International Electric Vehicle and Parts/Component Exhibition (EV CHINA 2000) as well as the third International Power Battery Exhibition.

In June 2000, Ningbo Municipal, Zhejiang Province hosted Electric Bike Festival. At the end of September 2000, Shanghai Municipal held Electric Bike New Product Presentation and one hundred electric bikes joined a tour publicity activity.

3 Prospering electric bike development

3.1 Electric bike development has a fairly long history and by now has experienced ups and downs twice. It is right in the third peak

R&D of electric bike started in 1960s. It experienced the first peak at the end of 1980s. At the time, the production quantity of YONG-JIOU (永久牌) electric bike reached 20,000 units/year. Due to more demand than supply in the market, supply by rationing tickets was required. However, this peak only lasted 3-4 years and started to decline due to falling behind performance of components like storage battery and troubles in use and maintenance.

In early 1990s, as pushed by the trend of energy saving, the second peak for the electric bike development was brewed, but was quickly wiped out by the emerging fuel-assist vehicle.

Table 2 Major makers and brands of electric bike

Seq.	Maker	Brand	Seq.	Maker
------	-------	-------	------	-------

No.			No.	
1	Shanghai Qian-He Electric Vehicle Development Co., Ltd.	Qian-He	15	(Kunshan) Giant Co., Ltd.
2	Shanghai Elida Electric Vehicle Development Co., Ltd.	Elida	16	Xuzhou Tian-Bao Electric Vehicle Co., Ltd.
3	Shanghai Ke-Fong Electric Vehicle Development Co., Ltd.	Ke-Fong	17	Hangzhou Jin-Song Group
4	Shanghai Qi-Shi Electric Vehicle Industry Co., Ltd.	Qi-Shi	18	Jinhua Green Energy Electric Vehicle Company
5	Shanghai Heng-Ye Electronics Co., Ltd. Electric Vehicle Branch	Aroma	19	Anshan Sportsman
6	Shanghai Zhong-Guang Electric Bike Company		20	Shenyang Wang-Da Motors Company
7	Shanghai Ai-Qi Bike Industry Company	Ai-Qi	21	Tianjin Tai-Da Electric Vehicle Company
8	Shanghai Yong-Jiou Co., Ltd.	Yong-Jiou	22	Tianjin Flying Pigeon Group
9	Shanghai Phoenix Co., Ltd.		23	Henan Anyang Flying Hawk Group
10	Nanjing General Electric Vehicle and Boat Co., Ltd.	Mainland Pigeon	24	Shenzhen Merida Bicycle Company
11	Suzhou Little Antelope Electric Vehicle Co., Ltd.	Hopping Antelope	25	Guangdong Yi-An Electric Vehicle Industry Co., Ltd.
12	Changzhou Fe-Tian Group	Flying Pace	26	Hainan Xin-Da-Zhou Motorcycle Company
13	Changzhou Tian-Sun Electric Vehicle Head Plant	Tien-Sheng	27	Chongqing Construction Group
14	Changzhou Yi-Xian Electric Vehicle Co., Ltd.	Discoverer	28	Chengdu Beite Electric Bike Co., Ltd.

In mid 1990s, the rapid development of fuel-assist vehicle brought problems like pollution, safety and resource waste. All countries in the world were more concerned about the atmospheric environment. The air pollution problem became serious in China's major cities like Shanghai and fuel-assist vehicle was one of the major pollutants. Under the joint influences from factors like the rapid development of Japanese electric bike and introduction of Taiwanese electric bike into China inland, the third peak for the electric bike development appeared.

3.2 Main characteristics of this peak

3.2.1 Many units taking part in R&D and production

According to statistics, by 2000 there were over 120 units in China engaged in R&D and production of electric bike and its parts/components. From 1998 to 2000, the numbers of units of engaged in electric bike and its parts/components that took part in the eighth to the tenth International Bicycle Exhibition China were respectively 60-70. Table 2 shows the major makers of electric bike.

3.2.2 Notable increase and constant improvement in performance

Electric bike now has a notable increase in performance compared to the old product in the first peak.

1) The whole bike

The whole bike of the old product weighted 57Kg and the continuous driving mileage was less than 40KM. On the other hand, the whole bike of the present

product weighs less than 35Kg and the continuous driving mileage is 50-60KM. In the third National Electric Bike Mileage Competition, the results were improving. In 1998, few contestants reached 45KM in Wuhan while in 1999 over 10 contestants achieved 70KM in Gueilin. In 2000, better results were achieved in Shijiazhuang. Bike Measurement Center (自行車檢測中心) measured a sample with 80KM of continuous driving mileage.

2) Generator

The old product used the disc-type generator in Fe-O permanent magnetic material, which was placed in the central shaft and weighed more than 10Kg with 50% of efficiency. What is commonly used now is the generator with Ru-Fe-B permanent magnetic trunk wheel, which weighs about 3.5Kg with about 80% of efficiency. The system transmission efficiency reaches 70-73% [11].

3) Storage battery

The old product used common lead storage battery with liquid opening, which used 2-phase 12V 36A cells with 864W of power and about 28Kg in weight. What is common used now is valve-control sealed lead storage battery, which has the merits like no acid spilling, no water added and easy maintenance. It uses 24V or 36V cells with 410-430W of power (50% less) and about 12Kg (40% lighter) in weight. The life of sealed storage battery is only 60-70 cycles at the beginning. After use for 3-5 months, the life is extended to 300 cycles now and usable for about 1 year.

3.2.3 Rapid Soaring production and marketing quantities [3-6, 8-9]

In 1997, the sales quantity was about 15,000 units, in which 4,000 units were from makers in Shanghai.

In 1998, the sales quantity was about 54,500 units, in which 11,000 units were from makers in Shanghai.

In 1999, the sales quantity was about 126,000 units, in which 21,000 units were from makers in Shanghai.

In the first half of 2000, it increased by 99.14% compared to the same period in the previous year. Among the makers, Shanghai Qian-He and Elida respectively increased by 326% and 247%, Suzhou Little Antelope 76%, Nanjing Mainland Pigeon 12.5%. The sales quantity continued to increase in the third quarter and the annual quantity was estimated to reach 240,000 units. Makers in Shanghai sold 43,000 units in total, in which 21,000 units by Elida, 17,000 units by Qian-He, 5,500 units by Yong-Jiou. The sales quantity of Merida in the first half of 2000 was 2,500 units and the annual quantity was estimated to reach 8,000-10,000 units. Giant test sold 100 units of Lafree Electric Bike in 2000 and would start production in Kunshan.

3.3 Enhancing management and package services

Implement the permit system for electric bike manufacturers.

Shanghai Municipal has created electricity charge and replacement stations to eliminate the concerns of users and enable them to use electric bike as conveniently as petroleum car.

4 Development and forecast of electric bike market [3-7]

Electric bike has the advantages such as light weight, low speed, small footage, both

manual and electric applications, no pollution, low noise, low price, low in-service fee and easy to operate. It can be used as a green transportation tool that features energy saving, rapidness, safety, convenience, durability and comfort. It is an essential supplement to personal transportation and this determines the future of vast electric bike market.

According to the survey in 1997 by National Bicycle Industry Information Center (全國自行車工業信息中心), 20% of bike riders in Shanghai was willing to change to electric bike at about RMB3,000.

The results of questionnaire survey performed by China Society Investigation Firm (中國社會調查事務所) in Beijing, Shanghai, Chengdu, Wuhan in 2000 were: 57% of interviewees willing to try electric bike; 34% remaining reserved; 94-96% thinking that rapidness, energy saving, comfort and good slope-climbing ability provided by electric bike meet the tempo of modern life; 38% thinking that electric bike meets the present consumption level. From these results, we can see that the acceptance rate for electric bike is as a whole higher than that in 1997.

Recently, National Bicycle Industry Information Center (全國自行車工業信息中心) made an analysis regarding policy, technical development and sales range and forecast 240,000 units in 2000, 300,000 units in 2001, 500,000 units in 2002.

The national bike possession quantity was about 450 million units. In the ten major cities (Beijing, Shanghai, Tianjin, Guangzhou, Wuhan, Nanking, Shenyang, Chengdu, Zhengzhou, Xian), the quantity is about 30 million units. As calculated based on the reserved 20% of replacement rate, there will be 6 million units of electric bike. In middle and small cities and other areas, the quantity is about 420 million unit. As calculated based on the reserved 20% of replacement rate, there will be 8.4 million units of electric bike. Therefore, the market scale will reach 14.4 million units. As the living standard is increasing, the market scale will continue to expand. Based on the depreciation rate of 10%/year, the annual demand will be 1.4-1.5 million units.

5 Factors affecting the market development

- 1) Given that electric bike has experienced ups and downs twice, the shadow still haunts the makers.
- 2) Quality stability is not satisfactory. There are over 50 brands permitted to sell in the market (in which 37 brands in Shanghai); however, less than 10 have more stable quality.
- 3) Consumers are mainly concerned about quality stability and reliability, life of storage battery, convenience and flexibility for electricity charge.
- 4) Fuel-assist vehicle is still in service and has the advantage in continuous driving mileage, rapidness and comfort.
- 5) Competition from gas-assist vehicle. To solve the serious pollution of fuel-assist vehicle in the atmosphere, gas-assist vehicle using LPG is developed in areas like Shanghai and Jiangsu. As shown in Table 3 and Table 4, gas-assist vehicle has the advantages such as high speed, long mileage and less emission than fuel-assist vehicle, but still has the setbacks like pollution and low safety. Therefore, electric bike still has market and room for development.

Table 3 Comparison between electric bike and other power assist vehicles

Item	Fuel-assist	Gas-assist	Electric	Electric
------	-------------	------------	----------	----------

	vehicle	vehicle	vehicle	Bike
Vehicle weight (Kg)	70-80	70-80	90-100	35-40
Max vehicle speed limit (KM/h)	24	24	24	20
Continuous driving mileage (KM)	150	150	50-60	50-60
Charging (Oil filling) time	Several minutes	Several minutes	5-8 hours (Fast charging in several minutes available)	5-8 hours (Fast charging in several minutes available)
Energy used	Petroleum	LPG	Battery	Battery and human power
Driving noise (db)	65-70	65-70	55-60	55-60
Status of emission pollution	Severe	Less severe	No	No
Technical maturity	Mature	More mature	More mature	Mature
Unit price (RMB)	4,000-10,000	4,000-6,000	5,000-8,000	2,000-3,000
In-service fee (RMB/100 KM)	17-22	16-18	14-16.5	5.7-6.6
Safety	Flammable	Flammable, Explosive	Good	Good
Helmet	Yes	Yes	Yes	No
Driver's license test	Yes	Yes	Yes	No
Age limit	Yes, over 18	Yes, over 18	Yes, over 18	No
Operation mode	Handle	Handle	Handle	Handle or pedal

6 Ways for facilitating the market development

- 1) Increase product quality; use high quality products of good brands; remove the shadow of ups and downs twice.
- 2) Complete services: optimize after-sale service, establish maintenance points, and expand charge and replacement stations to eliminate users' concerns.
- 3) Enhance publicity to make users understand, learn to use and make the good use of electric bike. Obtain support of governmental policies and provide bargain policy.
- 4) Enhance management; facilitate the growth of market scale; provide the society with high quality products of good brands at low prices.
- 5) Storage battery remains the key. Quality has great differences despite the large number of makers. There are few good batteries with stable quality and long life. It is essential to use good batteries with stable quality and long life.

Table 4 Comparison of in-service fees between electric bike and other power assist vehicles

Item	Fuel-assist vehicle	Gas-assist vehicle	Electric vehicle	Electric Bike
Fuel (electricity) (RMB/year)	750	700	120	60

Battery (RMB/year)	60	60	800	400
Maintenance (RMB/year)	550	550	60	30
Insurance (RMB/year)	100	100	100	0
Road maintenance (RMB/year)	50	50	50	0
Annual electricity (RMB/year)	50	50	50	0
Emission pollution (RMB/year)	100	60	0	0
Depreciation (RMB/year)	400-1,000	400-600	500-800	200-300
Subtotal	2,060-2,660	1,960-2,160	1,680-1,980	690-790
In-service fee (RMB/100 KM)	17-22	16.3-18	14-16.5	5.7-6.6

7 Bibliography

- [1] Mitsuru Mizutani, GS News 57 No. 1, p. 1 (1998)
- [2] Zhou Jian et. al., "Battery Industry" 5 No. 1 (2000)
- [3] "Electric Bike Journal", 2000.9.22.
- [4] "Xingmin Evening News", 2000.9.26.
- [5] "Electric Bike Generic Technical Conditions" (GB17761-1999) Common Electric Materials", 2000.3.20.
- [6] "Cycle Press" No. 1, 2000.9.1.
- [7] Xin Yuan-Min, "1997 Electric Vehicle Research and Development of China" (EV-6 Paper Collection), p. 15 (1997).
- [8] Lu Jin-Long, "China Bicycles" No. 6 (2000).
- [9] "China Bicycles" No. 11 (2000).
- [10] Xin Yuan-Min, "China Bicycles" No. 8-9 (2000).
- [11] "China Bicycles" No. 8-10 (2000).