

## Chinese Electric Vehicles in Rural Area

——Bicycle, Motorcycle, 3 wheel vehicle and “Low Speed Car” powered by Electric Motor——

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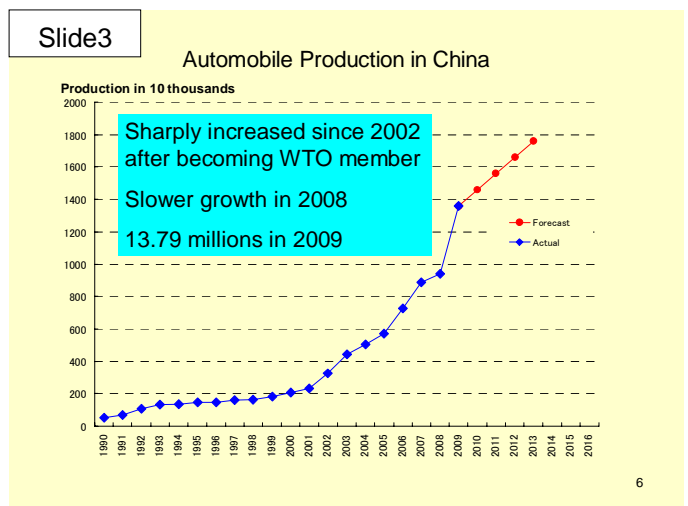
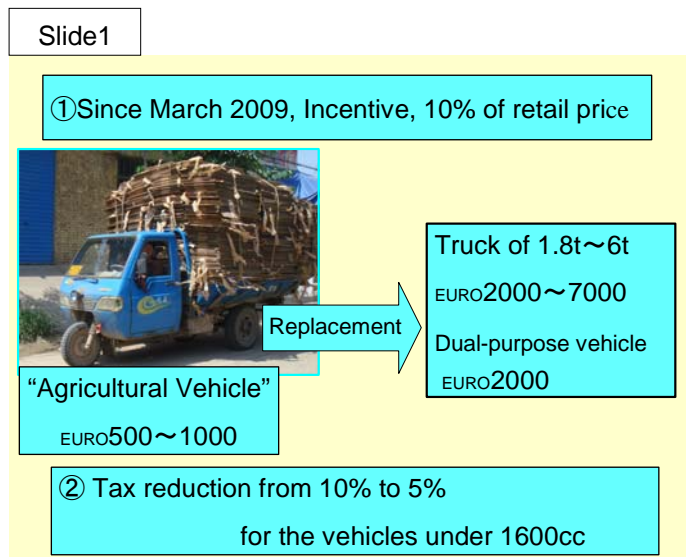
This paper intends to describe the popularization of electric vehicles in China. However we ignore the advanced and full-fledged electric vehicles developed by large automobile manufacturers. We focus on the simple and easily-generated electric vehicles made by minor makers including bicycle or motorcycle manufacturers. Especially we would like to pay attention to so-called “Low Speed Electric Car.”

### 1. Chinese Government eagerly popularize automobiles especially into rural area in China

#### 1.1 ‘Automobile Penetration into Rural Area’

Last year Chinese government began the “Automobile Penetration into Rural Area” policy [Slide1]. They offer “Automobile Replacement Incentives for Rural Areas.” Namely if a user replace the “Agricultural Vehicle” with truck or Dual-purpose vehicle, its user can obtain the incentives. (Dual-purpose vehicle means that they can use this vehicle both for passenger car and truck [Slide2].) Dual-purpose vehicle sales were doubled in 2009. As a result of that, automotive sales in rural area increased. And automobile production in China expanded and reached to 13.79 millions vehicles in 2009 compared with 9.30 millions in 2009 [Slide3].

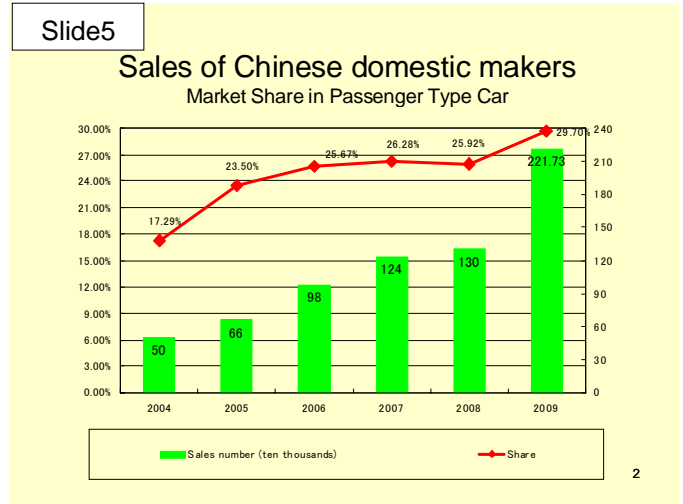
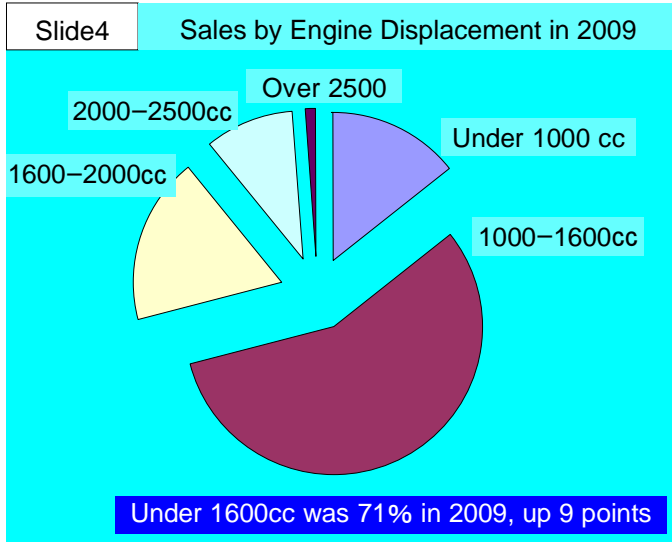
In next several years it may have pace-down. However the number of production vehicles will be above 18-20 millions by 2015. It means China will be the biggest market far beyond USA.



## 1.2 Increase of Small Engines (under 1600cc) and Domestic Manufacturers' Market Share

Firstly small vehicles with engine under 1600cc increased their sales share from 62% in 2008 to 71% in 2009 [Slide4]. Because Chinese government offers tax reduction from 10% to 5% for the vehicles with engine under 1600cc.

Secondly domestic automakers' market share increased from 25.92% in 2008 to 29.70 in 2009 [Slide5].



## 2. Many kinds of transportation means and electric vehicles in rural area

### 2.1 Field Research in the Agricultural Village

Last year we entered a village (北五女村) [Slide6] near Shijiazhuang city (石家庄市) and interviewed the village people in order to clarify the popularization of electric vehicles in rural area. Population of this village is 4000. Average income of people in this village is same level with Chinese national average, because this village is located 20km far from metropolitan area and some of village people work and get money there. Automobiles in use are around 200 vehicles in this village. Therefore they own 50 automobiles per 1000 persons comparing with 800 automobiles in USA and around 200 in Russia. This ratio of the village is also same level with Chinese national average.

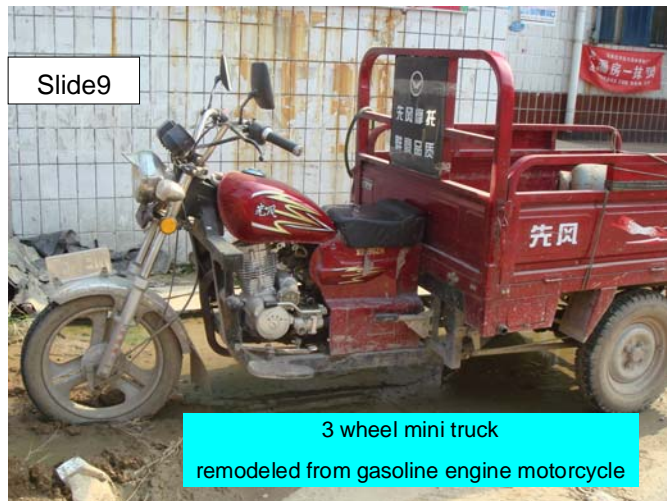


### 2.2 “Agricultural 3 Wheel Vehicles”

We could find that there were many kinds of transportation means and electric vehicles in rural area.

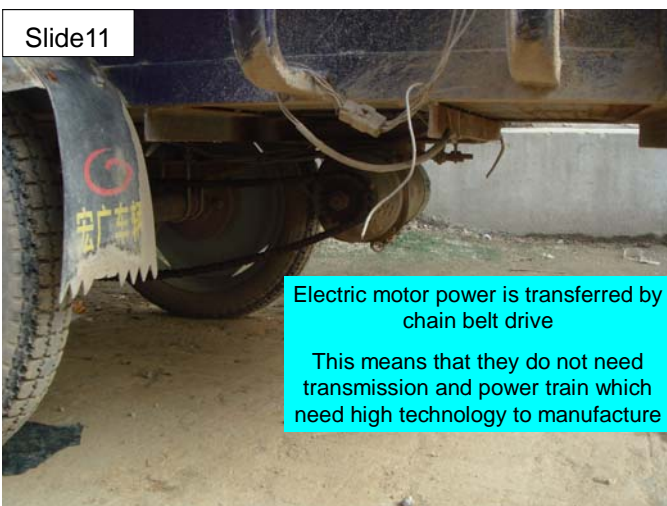
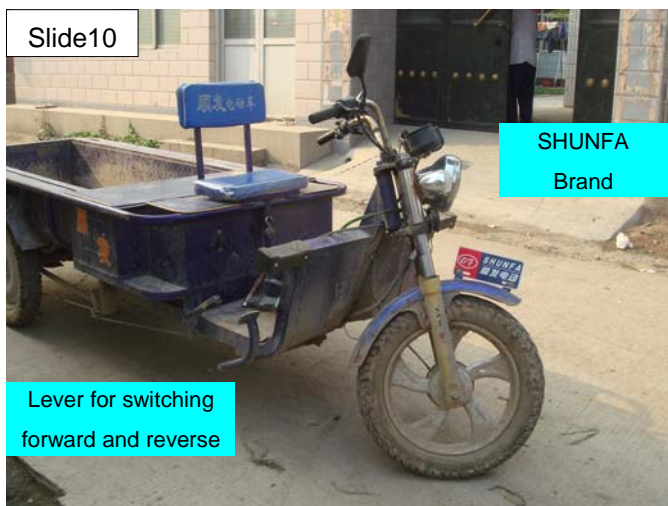
Firstly there are a lot of “Agricultural Vehicle” in local cities and rural area. Slide7 is a typical “Agricultural

Vehicles.” In China normal automobiles in use are 61 millions. However in addition to normal automobiles, there are around 15 million of “Agricultural Vehicles.” “Agricultural Vehicles” are cheaper than normal automobiles. They are usually allowed to drive without driver’s license and to overload like the vehicle in Slide7. In addition they sometimes do not have to pay tax because they do not register their vehicles. Vehicle in Figure8 is not registered because it does not have any number plate. Moreover vehicle in Slide9 is remodeled from motorcycle. Manufacturing cost is very low. Therefore these “Agricultural Vehicles” have strong cost competitiveness comparing with normal automobiles.



### 2.3 Electric 3 Wheel Vehicles




However we could find another more important point. There are a lot of electric 3 wheel vehicle, electric bicycles and electric motorcycles in rural areas, because of prohibition of gasoline engine motorcycle by local government. Firstly we discuss about the electric 3 wheel vehicles. Slide10 is typical type of electric 3 wheel vehicle. Power of electric motor under the body is transferred to axle by chain belt [Slide11]. This means that they do not need transmission and power train which need high technology to manufacture.



### 3. Electric bicycles and electric motorcycles

Here we would like to explain the classification of electric bicycle and electric motorcycle in Slide12. We divided electric bicycles into two types, bicycles assisted by electric battery and full electric bicycle. In 2008 bicycles assisted by electric battery were sold 0.7 millions. And full electric bicycles were 15.5 millions. Electric motorcycles were 4.8 millions. Total numbers of electric vehicles add up to 21.0 millions not including electric 3 wheel vehicles.

Slide12

| Classification  | Feature  | Sales in 2008<br>Prices      | Battery                                   |
|---|--|------------------------------|---|
| Bicycle assisted by Electric Battery<br> | Electric Battery assists the person  | 0.7 millions<br>EURO100~200  | Zinc carbon cell or Nickel                |
| Full Electric Bicycle<br>                | Can move only by electric motor<br>Sometime pedal<br>Less than 30km per hour | 15.5 millions<br>EURO200~400 | Zinc carbon cell<br>Nickel or Lithium-ion |
| Electric Motorcycles<br>                 | Battery motor<br>More than 30km per hour                                     | 4.8 millions<br>EURO300~600  | Zinc carbon cell<br>Nickel or Lithium-ion |

41

Source: NRI

#### 3.1 Electric Bicycles

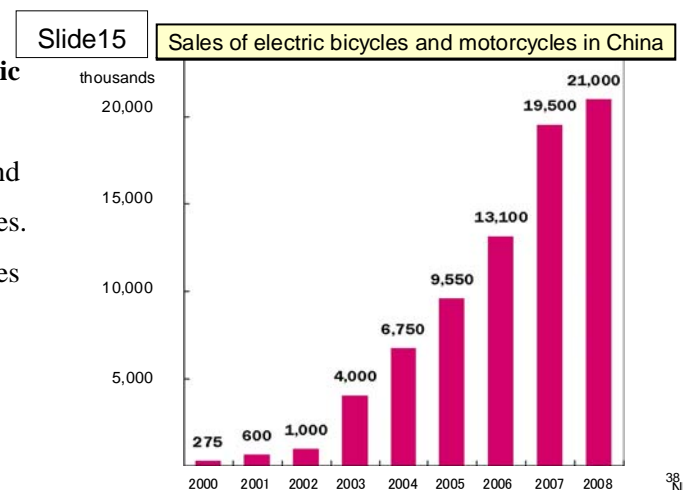
Slide13 is a typical family “car” in the rural area. 3 family members ride on a electric bicycle. This is not gasolin engine motoercycle nor nomal bicycle. This is elctric bicycle, exactly speaking full electric bicycle. The price is around €200~400.

They have to move by electric bicycles for shopping in metropolitan area, because gasoline engien motorcycles are prohibid in many big cities. If they use normal bicycles to go to metroplitan area, it takes more than one hour. As a result, electric bicycles increased rapidly in rural area [Slide14].



#### 3.2 Rapid Expansion of Electric Bicycles and Electric Motorcycles

Slide15 is the sales number of electric bicycles and electric motorcycles not including electric 3 wheel vehicles. This slide indicates that sales of these kinds of vehicles have been increasing since 2003, especially 2007.



Slide16

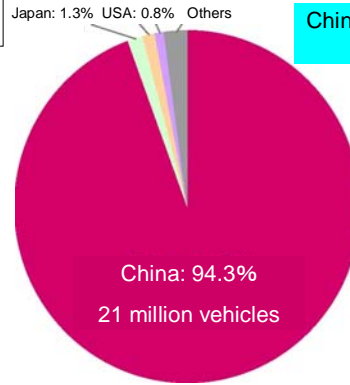
### Sales in 2008

|                     |               |
|---------------------|---------------|
| Bicycle             | 30.7 millions |
| Electric Bicycle    | 16.2          |
| Electric Motorcycle | 4.8           |
| Electric 3 Wheel    | ?             |
| Gasoline Motorcycle | 12.2 millions |
| Gasoline Automobile | 9.3 millions  |

42

### Global Share of Electric Vehicles in 2008 including bicycle etc.

Slide17



China is the largest country of electric vehicles

The number of manufacturers of electric vehicles is 2400

40 NRI

As showed in Slide16, in 2008 normal bicycles were sold 30.7 millions. Electric bicycles were 16.2 millions. Electric motorcycles were 4.8 millions. Gasoline engine motorcycles were 12.2 millions. Automobile were 9.3 millions. Total numbers of electric vehicles add up to 21.0 millions as explained before. And the share of Chinese electric vehicles is globally 94.3% in 2008 as showed in Slide17. China is a giant nation of electric vehicles.

Some companies already offer battery charge service for employee at their facilities. Employee can charge their electric vehicles during the daytime when they are working.

In addition under the oil import curtailment policy, gasoline engine motorcycles were restricted. As a result electric vehicles have been increasing rapidly.

## 4. Dilemma between Energy Policy and Environmental Policy in Popularization of Electric Vehicles

### 4.1 “Low Speed Electric Car” [Electric 4 Wheel Vehicles with Small Battery]

We already showed the electric 3 wheel vehicles like the extreme left ones in Slide18. If they cap the body on this 3 wheel vehicles, they can get electric 3 wheel cars like the second ones from the left. These electric 3 wheel cars are seen well in the local city, sometimes as taxis. Moreover if they add one more wheel to this 3 wheel car; they can get electric 4 wheel vehicles such as golf court or mini patrol car like the second ones from the right. Similarly they produce the electric mini cars like extreme right ones. These electric mini cars are called “Low Speed Electric Car”

in China. These cars are not yet approved by Chinese government. However local governments in several areas where some makers have been producing these “Low Speed Electric Car” already have approved these vehicles and allowed the drivers to run these vehicles on the road. Some local government allowed the users to run these “Low Speed Electric Car” without driver license in order to popularize them.

These “Low Speed Electric Car” are usually powered by zinc carbon or lithium-ion battery. Drive range by

Slide18

### Development of Electric Vehicles in China



NRI

one electric charge is around 80-100 km. Maximum speed is around 50-80 km. Price is around €2500~4500.

#### 4.2 “Low Speed Electric Car” in next several years

However these “Low Speed Electric Cars” are not yet so popular. One reason is that the number of the provinces where these “Low Speed Electric Cars” are approved are restricted. Another reason is that in terms of riding and traveling performance, these “Low Speed Electric Cars” are extremely worse than gasoline engine mini car such as the QQ of Chery Motor [Slide19].

Moreover in terms of cost competitiveness it is fact that the initial costs (mainly retail sales price) are not so different between “Low Speed Electric Cars” and gasoline engine mini car. Though the running cost of “Low Speed Electric Cars” are one fifth of gasoline



engine mini car. However it depends deeply on the factors that they do not have to get driver's license and do not have to pay tax and do not have to pay insurance fee. Though electricity expense is one fifth in the case of “Low Speed Electric Cars” comparing with gasoline engine mini cars, because of the short distance of drive range by one electric charge, they can not drive so long distance. So they cannot save money so much.

Chinese government is considering its approbation of “Low Speed Electric Cars.” Much severer safety standards might be imposed by government. If government approves “Low Speed Electric Cars” and requires its registration rigidly, paradoxically this “Low Speed Electric Car” will lose its biggest competitiveness. Because drivers have to get license and pay tax and insurance fee.

#### 4.2 Dilemma in Popularization of Electric Vehicles

However the issue is how they can generate the electric power for increasing electric vehicles. On the one hand, in terms of source of energy, coal-fired thermal power is 62% in China. Oil-fired thermal power is 20%. On the other hand, Chinese government wants to restrict oil consumption because the self-sufficiency ratio of oil has been decreasing to around 45% at present. China is one of the two largest net-importers of oil along with U.S.A. Therefore, though Chinese government plan to construct 50 nuclear power plants for increasing electricity demand, if they can not fill its demand, Chinese people may have to use coal-fired thermal power in order to run electric vehicles. In consequence electric vehicles may increase CO2 emission.

#### Summary

Firstly we find that there are many kinds of electric vehicles and transportation means especially in rural areas in China. They mostly often use electric bicyclers or electric motorcycles for commuting and carriages, because Chinese local governments prohibit people of riding motorcycles with gasoline engines in many large cities.

Secondly if we include electric bicycles and electric motorcycles into electric vehicles category, it means that 21.0 millions electric vehicles emerged in China in 2008. China is the largest country of electric vehicles

production.

Lastly we find that there is big dilemma between energy policy and environmental policy in popularization of electric vehicles. If electric vehicles will increase rapidly, they might use the coal-fired power in addition to nuclear electricity, because Chinese government put the highest priority to restrict oil consumption for national security. In consequence electric vehicles might increase CO2 emission.

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