

Fraunhofer ISI Discussion Papers *Innovation Systems and Policy Analysis* No. 30

ISSN 1612-1430

Karlsruhe, February 2012

Electric mobility in China – A policy review

Ulrike Tagscherer

Fraunhofer Institute for Systems
and Innovation Research ISI

Contents	Page
1 Introduction.....	1
2 Institutional arrangement and responsibilities.....	2
3 Industry policy	2
3.1 Automotive Industry Plans	2
3.2 Development Plan for Fuel-efficient and New Energy Vehicles 2011-2020	4
3.3 Investment in New Energy Vehicles.....	5
3.4 Ten Cities, one thousand Vehicles Program.....	6
3.5 State-owned Enterprise Electrical Vehicle Industry Alliance	7
4 R&D policies and funding	8
5 Development of transportation infrastructure.....	9
6 Government incentives for private users.....	10
7 Energy policy	11
7.1 Energy Consumption	12
7.2 Energy intensity	12
7.3 Renewable energy.....	13
8 National CO2 levels/limits.....	13
8.1 CO2-related taxation or fiscal policy and CO2 related sanctions	14
9 Conclusion.....	15
10 Literature.....	17

1 Introduction

In 2009, the annual car production in China was 13.8 million cars, a year-on-year increase of more than 48% (Sun 2010: 3). In 2010, automobile production reached 18,264,700 units, an increase of 32.4% compared with 2009. China's share of the global market for car sales amounts to 20%, up from 13% (Sun 2010: 4). China became the biggest car market in the world in 2010 (China Association of Automobile Manufacturers CAAM 2011). Considering the car ownership per capita, there is still a huge development potential for the Chinese car market. And it is exactly this huge development potential which makes analysts believe that China will become the largest market for electric vehicles in the future.

This belief is shared by the Chinese government, and the government has implemented or drafted several different policies and rules to support and speed up the development of electric vehicles. At the highest policy-making level, the Chinese government adopted the development of electric vehicles in its highest priority national plan, the 12th Five-Year Plan (12 FYP 2011-2015). At the same time, the electric vehicle industry has been selected as one of the seven strategic emerging industries by the National Development and Reform Commission (NDRC). This again has also been manifested in the 12 FYP. The overall goals foresee a rapid development of electrification of cars in China and by 2015 the number of electric cars on Chinese streets should reach 1 million.

The following analysis will take a deeper look into the different policies that are behind these developments in order to increase the understanding of the opportunities and challenges that lie ahead. Hence, contributing to an evaluation of the current development in this field is one of the major goals of this working paper.

As in all other countries, there is no single policy dedicated to electric mobility in China today. Yet there are many different policies from different ministries and agencies with different main targets which influence the development of e-mobility or electric vehicles to a certain degree. The following review looks especially at the impact of these different national policies on the development of electric vehicles and tries to analyze the relations between these policies as far as this is possible from an outsider's perspective.

The current strategy of the Chinese government concerning the development of electric vehicles is supported mainly by three major policy fields: support for R&D, support for the related industry, and support for private and public consumption. The majority of the policies are in fact industrial policies and they have been adopted by the highest levels of government.

2 Institutional arrangement and responsibilities

One of the most important actors with regard to electric vehicles is the Ministry of Industry and Information (MIIT), which is responsible for the development of the electric vehicle industry and everything related to this industrial development. MIIT is the leading ministry with regard to the industrial development planning process, the industrial policy and the related standards. Besides MIIT, the Energy Bureau is of key importance, as it is responsible for heading the development of electric vehicle charging facilities, including the planning process for the infrastructure. It is also responsible for coordinating this planning with the national energy planning.

The Ministry of Science and Technology (MOST) is in charge of the large national R&D programs, which include the research (basic and applied) for electric vehicles. The National Standardization Administration of China (SAC) under the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) is the leading organization in the development, approval, publication, and promotion of the national standards for electric vehicles and charging facilities. It is the organizing and coordinating body for the Ministry of Industry and Information Technology, the Energy Bureau, the Ministry of Science and Technology and other departments which develop electric vehicles and charging facilities standards.

3 Industry policy

The MIIT has issued a number of policies which influence the development of electric vehicles. The most important policies and programs will be described in this chapter.

3.1 Automotive Industry Plans

One of the major policies is the *"Auto Industry Restructuring and Revitalization Plan"*¹, which was introduced in March 2009. It also supports the development of new energy vehicles and sets clear development targets: 500,000 electric cars should be produced by 2011, which will account for 5% of all new car sales by the end of 2011.

¹ One of the major policies of this planning was to reduce the vehicle purchase tax from 10% to 5% for cars with 1.6l or below.

Other policies which are paving the way for electric vehicles are the "*Automobile and Motorcycle going to Countryside*"² and "*Speeding up Renovation and Scrapping of Old Cars*"³. The latter shows the government's determination to get rid of old and highly polluting cars, but also its support for the automotive industry in general. With these three major policies realized, in 2009 the car sales for mini passenger cars rose by 80% and for mini trucks by 70% (Sun 2010: 4).

The "*Directory of Recommended Types of Energy Saving and New Energy Vehicle Demonstration Projects for Promotion Application*" is a directive of the Chinese government to set the priorities for the government's financial support for electric vehicles. It has also led to the strategy formulation for new energy vehicles by all the major car manufacturers in China. According to Chinese statistics, 76 different new energy vehicles (cars and buses) exist, which are produced by 27 companies (Sun 2010: 12). The Minister of Science and Technology, Wan Gang, mentioned in a meeting on electric mobility between ministries in China and Germany that, by October 2011, a total number of 135 different vehicles have been categorized as "new energy vehicle" (meeting held on October 24, 2011 in Beijing).

In June 2009, MIIT published rules which define the scope of the 'term new energy vehicles' ("*Admittance Management Rules for New Energy Auto Manufacturing Companies and Products*"). The term new energy vehicle applies for HEV, EV, FCV, vehicles based on other new energy sources and other categories of products. These different technological paths are then divided into three stages: the initial stage, development stage and mature stage. Criteria for these stages are the maturity of technical principles, technology and production processes and national and international standards (Sun 2010: 14-15).

The Ministry of Industry and Information Technology (MIIT) has drafted a new plan for the "*Development of New Energy Vehicle Industry*", which will be accepted by the State Council and become part of the 12th Five-Year-Plan (2011-2015). This plan will guide the development of China's new energy vehicle development until 2020. The draft of this plan will be outlined in the following section, even although it is possible that the final plan may include some major changes to this draft version.

2 This program spent 8.5 billion RMB in subsidies for farmers' purchases of mini-buses or light trucks of 1.3l or below to scrap the old and more polluting trucks (Sun 2010).

3 In 2009 1 billion RMB was spent in this program, up from 0.6 billion in 2008 (Sun 2010).

3.2 Development Plan for Fuel-efficient and New Energy Vehicles 2011-2020

The currently drafted "*Development Plan for Fuel-efficient and New Energy Vehicles*" dated 2010 can be seen as the major industrial plan to support the new energy car industry. This plan aims to support the whole industry chain of fuel-efficient and new energy cars, including the development of standards and regulations, and to reach a world level with the three key components of electric engine, drive train and battery. The plan proposes that the sales of China's new energy vehicles will be the number one in the world by 2020. It focuses on the development of pure electric cars⁴ and the government will invest around 100 billion CNY for the development of the whole industrial chain of new energy vehicles (Li 2010).

The plan is targeted for 2020, but includes 2 different phases. In phase one (2011-2015) Chinese-owned IP for core technologies like battery, motor and electric control will be created and developed. This will be the initial stage for developing pure electric vehicles and plug-in hybrid cars with a total production reaching 500 000 cars. The market volume should reach over 1 million⁵ by 2015 for all the different types of hybrid cars. In this period, Chinese enterprises will manage to produce the necessary key technology, e.g. advanced internal combustion engine, automatic transmission, automotive electronics, lightweight materials etc. All new cars produced by then (with combustion engines or hybrids) need to have a fuel consumption that is below 5.6 liters per 100 km (Li 2010; Yun 2011).

Phase two (2016-2020) will put more emphasis on developing pure electric cars and plug-in hybrid cars. Their total (accumulated) market volume should reach 5 million cars. The key technologies will be broadly diffused in this period and then fuel consumption of new cars should be reduced to 4.5 liters/100km (Li 2010). By then, Chinese sales of fuel-efficient and new energy vehicles should be number one in the world (Yun 2011).

Chinese industrial experts have been saying that these numbers are not static and will be adjusted during the plan if necessary.

4 According to interviews with Chinese experts, this seems to be the major reason for the delay of the publication of the plan. It is said that while MOST sees pure EV as the leading technology, MIIT sees HEV having a similar importance for industrial development.

5 In 2009 the total sales of cars in China was 13 million cars (The Climate Group 2010a: 2)

Government officials plan to transform the Chinese automotive industry in the direction of pure electric and plug-in hybrid cars, yet still looking to the further development and improvement of the traditional car industry and technology (Li 2010).

Besides the investment plans and the division into two major phases, the new plan emphasizes the concentration of the leading-edge enterprises in "national teams". These national teams will build on the existing key auto enterprises in China and the existing energy-saving and new energy vehicle industrial bases in Changchun, Shanghai, Wuhan, Chongqing, Beijing, Guangdong, Anhui (and others). They will establish pilot bases for the new energy vehicles industry and combine them with demonstration projects. By 2020 the industrial concentration of the bases mentioned above should be 90% (Li 2010).

The companies will form 2-3 large automobile enterprise groups with a production and sales volume of over 6 million cars per year. Another 1-2 automobile groups with production and sales volume of over 1 million new energy vehicles and 3-5 automobile enterprise groups with a volume of 500,000 cars will be established. The main reason for this concentration is seen in avoiding indiscriminate investments and low-level developments as well as redundant investments (Li 2010).

Industrial plants to produce lithium-ion batteries will be concentrated in Tianjin, Shenzhen and Hangzhou. 2-3 leading battery enterprises with production and sales over 20 billion watt hours and the capacity for R&D and production of cell materials' will be established (Li 2010).

The plan mentions establishing and improving standards and regulations for small low-speed pure electric vehicles. This should give enterprises which are not part of the "national teams" the opportunity to enter the field of electric cars as well (Li 2010).

3.3 Investment in New Energy Vehicles

The Chinese government has shown its commitment to new energy vehicle industry development already by planning to issue the above mentioned plan through the State Council (and not at the Ministry level). It shows this commitment also through the investment of 100 billion CNY (15 billion USD), according to the *"Development Plan for Fuel-efficient and New Energy Vehicles"* (Li 2010). Of this amount, 50 billion will be put into special funds of the energy-saving and new energy vehicle industry, supporting R&D in key technologies and industrialization and promoting joint mechanisms like public platforms. 30 billion are reserved for demonstration purposes and the diffusion of new energy vehicles. Another 20 billion will flow into the promotion of energy of energy

saving vehicles with a special focus on hybrid vehicles. Another 10 billion are reserved to support the core automotive component industry and 5 billion to build pilot urban infrastructure projects (Li 2010).

3.4 Ten Cities, one thousand Vehicles Program

In 2009 the Chinese government (Ministry of Science and Technology, Ministry of Finance, Ministry of Industry and Information Technology and NDRC) introduced the "*Ten cities, one thousand vehicles Program*", which shall help to encourage the public and private use of electric cars through demonstration projects in these cities. In this plan, 1,000 vehicles will be introduced every year for three years in these ten cities.

In 2010 a total of 13 cities were chosen to participate in this program by the Ministry of Finance and the Ministry of Science and Technology, which are jointly running the program. These 13 cities are Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming, and Nanchang (Lin et al. 2010; Yun 2011), but in the meantime other cities have joined as well. The second group of cities participating is Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan and Guangzhou (Yun 2011). Experts reported that in late 2010 another 5 cities joined the project (interview with Prof. Wang Yi, February 28, 2010).

The project is a demonstration project for new energy vehicles and is meant to promote the technology as well as the industry. The central government sets some framework conditions for the support, but the local governments need to implement the demonstration projects according to their own local needs and necessities. This leads to each city setting up its own policy to promote new energy vehicles, setting up own industrial alliances, creating its own guidelines for financial support and providing its own (additional) funds.

Even though government regulations make open bidding necessary for these demonstration projects, eight city governments (out of the first 13 cities) purchased their first batch of vehicles from their local car manufacturers only. Some experts are therefore worried that local interests may conflict with the national industrial policies and that local protectionism will violate central policies (Lin et al. 2010: 16). There might be a risk of developing the same technologies in many places at the same time and wasting public money. Also, some companies may receive strong support, even though their technology level may never reach the national or the international standard and therefore weakens China's international competitiveness in the long term (Sun 2010).

For the cities, the investment in the local automotive industry is seen as an instrument to increase outside investment in the city and therefore seen as an investment in the city's attractiveness for investment from outside.

Official statistics given by the cities or respective government agencies state that Shanghai, Changsha and Beijing together have already purchased more than 3,000 new energy vehicles and the total number in the 13 model cities has reached more 5,500 cars.

Yet non-government organizations estimate that in fact by 2010 there were about 2,000 new energy vehicles on China's roads. Most of these e-vehicles are used as taxis and buses (Huo et al. 2010) and private consumption is still lacking so far. This is supported by the information that, of the 100 BYD E6 ordered by the Shenzhen city government, by 2010 half of them had been delivered.

3.5 State-owned Enterprise Electrical Vehicle Industry Alliance

In August 2010 the "*State-owned Enterprise Electrical Vehicle Industry Alliance*" (SEVIA) was formed under SASAC. SASAC is the State-owned Assets Supervision and Administration Commission of the State Council which is responsible for managing China's state-owned enterprises. The Alliance brings together the largest Chinese state-owned companies in the fields of automotive industry, battery industry, charging services, electrical industry, real estate development and production in a non-profit organization. SEVIA is intended to become a cooperation platform which companies can voluntarily join and which creates mutual benefit (<http://sevia.sasac.gov.cn>).

The current members of SEVIA are:

- *Committee of the Vehicle and the Electric Drive*: China First Automobile Group Corporation, Dongfeng Motor Corporation, Chang'an Automobile China Ordnance Equipment Group Corporation, China Eastern and China Southern Electric Group Co., Ltd. Car Group;
- *Battery Professional Committee*: China National Offshore Oil Corporation, Beijing Non-ferrous Metal Research Institute, China Aviation Industry Corporation, China Aerospace Science and Technology Corporation and China Aerospace Science and Industry Corporation;
- *Charging and service professional committees*: National Grid Company, China Pujian Information Industry Group Corporation, China Southern Power Grid Co., Ltd.,

China National Petroleum Corporation, China Petrochemical Corporation and China Poly Group Corporation (<http://sevia.sasac.gov.cn>).

Analysts have expressed their hope that the alliance will increase resource integration in electric cars (Li 2010).

The main tasks of the alliance are to implement the national development plans for electric vehicles, set respective standards and joint research. The members of SEVIA are planning to invest 14.7 billion USD in the development of electric cars and the supporting industry (<http://sevia.sasac.gov.cn/n7445291/index.html>).

4 R&D policies and funding

MOST started to support the R&D of new energy vehicles in a significant and visible way during the 10th FYP (2001-2005), especially in its applied research program called "863". The R&D program supported three key technologies (three verticals): fuel cell, pure electric and hybrid technologies as well as the three key technology areas (three horizontals) of power engine, drive and battery. The research activities were mainly done in R&D institutes, universities and in a few R&D departments of state-owned enterprises (Sun 2010; Yun 2011).

Fuel cell development, hybrid technologies and pure electric vehicles were also supported by MOST under the 11th FYP, again especially in the 863 program. Sun (2010: 30) reports that China spent 1.1 billion RMB on new energy vehicles during the 11th FYP. Together with enterprise investments, this amount may be around 10 billion RMB (1.5 billion USD) in total, which is considered to be a rather small investment. Lin et al. (Lin et al. 2010: 5) refer to 2 billion RMB of R&D investment by national government so far.

The *"Mid-to-long Term plan for Science and Technology (2006-2020)"* which was mainly drafted by MOST also includes the research and development of new energy cars, e.g. "low power and new energy vehicles" and "hydrogen fuel cell technology" projects (Yun 2011).

The *"Development Plan for Fuel-efficient and New Energy Vehicles"*, which was announced in its draft form in 2010 by the State Council, also includes the establishment of public R&D platforms and the creation of a new national research test base for fuel-efficient and new energy vehicles and parts. This research test base will rely on existing national research institutes and universities, will establish test platforms and product development data for industry-wide sharing (Li 2010).

Another new governmental initiative under the above mentioned plan is the establishment of a national power battery research institute which should be internationally competitive. The plan also addresses the formation of 2-3 leading battery enterprises with production and sales over 20 billion watt hours and the capacity for R&D and production of cell materials (Li 2010).

The plan gives very clear guidelines for the indigenous part of the new energy car development: key parts of the new energy vehicles, like battery, motor and powertrain should be developed with independent research capacity. This means that no less than 51% of the IP has to be local (Li 2010).

In the "12 FYP", support of technology development of Chinese enterprises is one of the key task for government. It is planned to implement even more favorable tax policies to encourage the enterprises to develop more indigenous technology innovations in order to overcome to current technical problems. One can expect that the R&D investments in the development of new energy vehicles will be higher than in the 11 FYP. At the moment, no official statistics for R&D investment during the 12 FYP were found (The Climate Group 2010c).

5 Development of transportation infrastructure

Many Chinese cities are implementing their low carbon plans through investment in the transportation infrastructure and by supporting public transport and low carbon vehicles, from bicycles to e-cars. In Beijing, for example, there were more than 4,000 buses using liquefied natural gas (LNG) in 2007. By 2008, the fleet of LNG busses in the whole of China has reached approximately 500,000 buses in more than 80 cities (The Climate Group 2010a: 5).

For the further development of new energy vehicles, the respective infrastructure is of key importance. At the national level, State Grid Corporation, China Southern Power Grid, Sinopec, CNOOC and other leading Chinese energy companies in 2009 announced their future plans for constructing electric vehicle charging stations. State Grid Corporation alone plans to build 10,000 charging stations and more than 500,000 charge piles/poles by 2020. Their investment in major equipment and the charging stations is reported to reach 32.3 billion CNY (<http://www.nevinfrastructuresummit.com/overview.html>).

In addition, in 2010 the Ministry of Industry and Information Technology (MIIT) approved four standards concerning new energy vehicles. These standards are "Electric Vehicle Charging Connectors", "General Requirement on Electric Vehicle Charging

Stations", "Communication Protocol between Battery Management System and Off-board Chargers" and "Test Methods of Light Hybrid Electric Vehicle Energy Consumption" (<http://www.nevinfrastructuresummit.com/overview.html>). According to a speech by Minister Wan Gang from MOST, the total number of existing standards for electric vehicles is 57 (by March 2011), with another 59 standards being currently examined.

At the local level, infrastructure development has also attracted government attention. In Shenzhen, for example, two stations were put into service in 2009 together with 134 pole chargers around town. While the two centralized stations offer quick charging times, the poles are for slow charging, which is mainly done over night. At the time of its establishment, this was the largest investment for charging stations in China (People's Daily Online 2009). The total investment for this station was 1.5 million USD. In 2010 the China Southern Power Grid Co. Ltd. opened two more charging stations in Shenzhen, which can recharge 18 vehicles at the same time (Hao in China Daily, 24.06.2010).

In the meantime, other cities followed in building the respective infrastructure. In May 2010 the Tianjin government signed agreements with the Tianjin Electric Power Corporation to build 5 electric vehicle charging stations in the city during the year.

In 2010, the largest charging station was build in Linyi City in Shandong province. It can recharge 30 cars and 15 buses at the same time. Its total capacity reaches 3,200 kilovolt ampere. It is run by the State Grid Company, which operates 6 other stations and plans to open 75 more stations in 2011 (Hao in China Daily, 24.06.2010).

According to Lin et al. (2010: 6), less than 20 charging stations were built in the 13 cities that participate in the 13 cities 10,000 cars project. They see no progress in the further establishment of charging stations unless the government heavily supports it and creates new business models, as no short-term business is success to be expected from charging stations. This limits the interest of enterprises to invest in this field. This can be seen as one of the biggest bottlenecks in China's development of electric cars (Accenture 2011; Lin et al. 2010).

6 Government incentives for private users

So far, new energy vehicles incur significantly higher costs than cars with traditional combustion engines. In early 2010, the costs for a BYD E6, for example, were about 300,000 CNY (43,000 USD).

With the announcement of the *"New Energy Vehicle Demonstration and Promotion Notice"* in January 2009, the Chinese government paved the legal way for implementing financial subsidies for the purchase of public vehicles. Following this notice, the Ministry of Finance (MOFCOM), the Ministry of Science and Technology (MOST) and the National Development and Reform Commission (NDRC) in June 2010 introduced the first pilot project for private consumer subsidies (*Pilot Project for subsidies for the purchase of new energy vehicles*). In the five cities of Shanghai, Shenzhen, Hangzhou, Changchun and Hefei, consumers can get government subsidies for the private purchase of fuel-efficient and new energy cars. For pure electric cars, the subsidy is 60,000 CNY per and 50,000 CNY for plug-in hybrid vehicles (Wan/Li 2010; Yun 2011). In all other regions, purchases on the part of private consumers are not yet intended.

Local governments, e.g. in Shenzhen and Changchun, have implemented additional local subsidies to make the purchase even more attractive. In addition to the financial support at the national level, Shenzhen government has decided to subsidize the purchase of locally made cars. The city offers up to 60% discounts on the local new energy and fuel-efficient vehicles. To buy the BYDF3 dual mode hybrid, which costs 149,800 CNY, the consumer will be able to get a discount of almost 90,000 CNY. A similar scheme can be found in Chongqing, where 36,000 CNY in subsidies and an exemption from bridge/road tolls of 7,000 CNY can be gained by consumers when buying the local brand of (Junjie/Jiexun) hybrid MPV. Its regular price is 140,000 CNY (<http://green.autoblog.com/2009/05/15/chinese-cities-offering-incentives-to-buy-locally-made-hybrid-ca/>).

In the 12 FYP the government intends to introduce a tax system reform for vehicles which supports the consumer. Also, the public procurement of e-vehicles will support the consumers indirectly by scaling-up production and the related cost benefits (The Climate Group 2010c). On the other hand, some experts think that the technology is not mature enough to invest in subsidies for private consumption and that the government should invest more in infrastructure and surrounding services and business models first.

7 Energy policy

In recent years, China's oil consumption increased at a high growth rate. As official reports state, the predicted oil consumption has increased by 17% between 2006 and 2010 and will increase by 62% between 2006 and 2020. In 2009, China's oil production was 200 million tons less than its consumption (Sun 2010: 5). In 2009, 52% of China's oil was imported (The Climate Group 2010a: 2).

Out of this growth, an increasing growth is coming from refined oil demand.

At the same time, an increase in cars per year of 10 million units in the coming years is predicted, which will increase the burden on the oil demand and oil imports.

The development of new energy vehicles therefore could support many of China's goals. First, it could support the easing of its dependence on oil imports. Second, it could lift the burden of heavy pollution in Chinese cities and third, it could reduce the high carbon dioxide emissions of the current transport sector.

7.1 Energy Consumption

Annual increase of energy consumption in China has been 13.5% between 2000 and 2007 and it is forecast to reach 5% annually for the next 20 years (Huo et al. 2010: 2) As industry and households are responsible for the major part, electric vehicles are not seen as a major reason to change power generation capacity, even when the most optimistic scenarios are taken into account.

In the period of the 12 FYP (2011-2015), the proportion of non-fossil fuels in primary energy consumption will reach 11.4% from 8.3% in 2010. This includes nuclear energy as well as renewable energy. Energy consumption per unit of GDP will be reduced by 16% during the same time period (Li 2011).

During this 5 year period, China will build nuclear power plants with a generation capacity of 40 million KW and hydropower plants with a capacity of 120 million KW. 70 million KW wind power capacity and five million KW solar power will also be newly created.

7.2 Energy intensity

The target for improving energy intensity in the 11 FYP was 20% compared to 2005. Energy intensity is one of the main indicators in China's economic planning and is compiled as energy consumption per unit of GDP. Some cities have even set their targets above 20% improvement. In the Copenhagen accord China agreed to improve its carbon intensity to 40-45% compared to 2005 by 2020. According to press announcements during the People's Congress Sessions in March 2011, the improvement of energy intensity for the 11 FYP was 19.1% and has almost perfectly reached the 20% goal (Li 2011).

The 12th FYP for the first time includes formalized reduction targets for both energy and climate change, aiming to reduce energy intensity by 16% and greenhouse gas emissions by 17%.

7.3 Renewable energy

The target for the development of renewable energies was set at 15% of the total energy mix by 2020 in the Mid-to-long Term Plan for Science and Technology 2006-2020. In the 12 FYP, the goal for the amount of renewable energies in the total energy mix is set at 11.4% by 2015.

8 National CO2 levels/limits

In 2009 China's oil consumption reached 4,000 billion tons, which accounts for more than 10% of world consumption. At the same time, China has become the largest CO2 emitting country in the world. In 2008, 22.3% of the global CO2 emissions were in China (International Energy Agency 2011).

In China, electric vehicles or electric mobility is seen as an important development to reduce CO2 emissions and combat climate change. In 2009 China set its goal for the reduction of greenhouse gas emission intensity. As stated in the previous chapter, by 2020 the CO2 emissions per unit of gross domestic product should be 40-45% below the level of 2005.

The 12 FYP has set out the next steps for reaching this goal and until 2015 China should reduce its CO2 intensity per GDP unit by 17%. China has not set any official goals for the reduction of the total amount of CO2 emissions. If the targets are met, than China's CO2 emissions will rise from 7.02 Gt in 2010 to 8.17 Gt in 2015. This will avoid 0.83 Gt CO2 compared to the previous path (The Climate Group 2011: 2).

The amount of CO2 that can be saved by electric cars compared to traditional fuel cars varies between 13-68% (The Climate Group 2010b). German studies estimate that the reduction of greenhouse gas emissions by electric cars which use regenerative or low carbon emission energy sources can be four to five times compared to combustion engines, even if these are assumed to increase their efficiency as well (Wiet-schel/Dallinger 2008).

Together with the development of smart grids and technologies that allow for using car batteries as part of the storage system of the grid, electric mobility could directly reduce

the CO2 emissions and other pollutants as well. This would be a major step towards solving China's current problem of urban air pollution. In the 12 FYP the government intends to set up more stringent emission standards to promote technological innovation in electric vehicles (The Climate Group 2010c).

As Huo et al. (2010) point out, the benefits of CO2 reduction heavily depend on a region's energy mix and it can easily switch from positive to negative. "EVs powered by coal-based electricity could increase CO2 emissions by 7.3% compared to gasoline ICEVs" (Huo et al. 2010: 2). In regions with a high degree of coal-based electricity like the north, northeast and east of China, the reduction of CO2 will be not exist or be minimal, while in the south and some central parts, where the energy mix consists of a higher share of renewable energy, electric vehicles could help to reduce CO2 emissions.

The fact that China will increase the share of renewable energies in its energy mix to 15% by 2020 will have an impact on CO2 emissions. Yet the possibilities and opportunities of linking new energy vehicles development with the energy system transformation seem not to be taken sufficiently into consideration at this point of time. Experts doubt therefore that there will be any significant savings of CO2 through the development of new energy vehicles.

8.1 CO2-related taxation or fiscal policy and CO2 related sanctions

Sanctions for high CO2 emission cars have been discussed recently (Chunzhe in China Daily, 27.01.2010). It is said that the Beijing Development and Reform Commission is intending to implement a CO2 tax during the current FYP. So far, these policies have not yet been introduced.

Until December 2011 no CO-related policies were introduced for the automotive industry in China. The only goal that has been set is the increase of the carbon intensity, which does not include a reduction of CO2 in general. So far, such policies are not broadly discussed and it might take some time before they are introduced in China. Yet there are a number of fiscal policies, e.g. taxation, which will help new energies to accelerate their development and that are directly or indirectly linked to the electric car industry.

In 2010, the fiscal policies related to new energy include ten key measures, of which nearly half are directly or indirectly linked to electric vehicles⁶:

- strong support for wind power (develop the whole industry chain),
- implementation of the "golden sun project" (fiscal subsidies to launch the domestic PV market),
- financial subsidies for the pilot project of energy saving and new energy vehicles,
- accelerate the implementation of ten key energy conservation projects, and
- eliminate backward production capacity (Industry Observe 2010)

Even though there are no statistics available on how much funding goes into each of these measures, one can assume that the funding will be significant, because of the high political importance of the topic.

9 Conclusion

Even though several experts and studies state that by further developing new energies China could mitigate at least 10% of its emissions from the transportation sector (Accenture 2011: 44), there is still a huge coordination gap between the policy and decision-making of energy-, environment- and transport-related governmental bodies.

Even though many policy announcements as well as scientific papers refer in their introduction to climate change and CO₂ reductions, the policies themselves seem far from being linked with each other. This is also the opinion of all the Chinese experts interviewed for this project. It is quite striking that in most cases new energy vehicles are not even discussed in relation with renewable energies, and most scientists seem to take it for granted that the electricity for the new energy vehicles will mainly come from coal-fired power plants.

As the study of Huo et al. (2010) about the environmental impact of pure electric vehicles shows, the situation in China may be different to other countries. The major influencing factors are the current high emissions of power plants (mainly coal) and the fact that electricity demand in China is still growing. So the growth in demand will offset any benefits from the development of electric vehicles and the climate-related effects will be marginal. Therefore, HEVs seem to be more environmentally friendly, more

⁶ According to an interview given by the Vice Minister of Finance, Zhang Shaochun, on May 21st, 2009, cited from Industry Observe, 2010-7.

commercially mature and less cost-intensive and may be the better choice for China. For pure electric vehicles, the Chinese government would need a clear strategy concerning emission control of coal-fired power plants as well as special low carbon electricity concepts would be needed.

The different policies mentioned in this paper are mostly drafted by very different ministries and with very different goals. As in most countries, policy coherence in China is a difficult task. It might be even more pronounced in China today, as reaching certain goals is closely linked to the promotion of government officials. Incentives to link policies or policy goals can so far not be seen. Unless these systemic weaknesses are addressed, the development of new energy vehicles seems to be quite separate from energy policies and from policies to mitigate climate change. Therefore, the benefit for the environment may be less than currently expected by many scholars and politicians.

10 Literature

- Accenture (2011): The United States and China: The Race to Disruptive Transport Technologies. Online: <http://www.accenture.com/us-en/Pages/insight-us-china-transport-technologies.aspx>.
- China Association of Automobile Manufacturers CAAM (2011): Statistical Data. China Association of Automobile Manufacturers CAAM. Online: <http://www.caam.org.cn/AutomotivesStatistics/20110121/1105051628.html> (accessed: 08.03.2011).
- Chunzhe, Z. (2010): China to tax vehicle emissions. Beijing: China Daily. Online: http://www.chinadaily.com.cn/china/2010-01-27/content_9384311.thm (accessed: 09.02.2011).
- Hao, Y. (2010): China opens its largest E-car recharging station. Beijing: China Daily. Online: http://www.chinadaily.com.cn/bizchina/2010-06/24/content_10015969.htm (accessed: 29.02.2012).
- Huo, H./Zhang, Q./Wang, M.Q./Streets, D.G./He, K. (2010): Environmental Implication of Electric Vehicles in China, *Environmental Science and Technology*, 44, 4856-4861.
- Industry Observe (2010): Fiscal policy consideration for the promotion of the development of new energy automotive industry. Online: <http://www.docin.com/p-243199248.html> (accessed: 30.01.12 A.D.).
- International Energy Agency (2011): CO2 Emissions from Fuel Combustion, 2011 Edition. Paris: International Energy Agency. Online: <http://www.iea.org/co2highlights/co2highlights.pdf>.
- Li, G. (2010): Outlook of the planning for new energy vehicles – the goal to be number one in 2020. Online: <http://auto.sina.com.cn/news/2010-08-07/0917635965.shtml> (accessed: 10.01.12 A.D.).
- Li, J. (2011): New energy targets to produce greener nation. China Daily. Online: http://www.chinadaily.com.cn/cndy/2011-03/06/content_12122336.htm (accessed: 06.03.2011).
- Lin, Z./Chen, L./Xue, L. (2010): How do local governments implement policies of low carbon industry? A case study on the implementation of demonstration project for new energy vehicles, 32nd Annual APPAM Research Conference. Boston, MA.

- People's Daily Online (2009): 'Filling stations' for electric automobiles installed in Shenzhen. Online: <http://english.people.com.cn/90001/90778/90860/6855124.html>.
- Sun, L. (2010): China's Development and Policies of New Energy Auto Industry (= ITEC Working Paper Series No. 10). Kyoto, Japan: Institute for Technology, Enterprise and Competitiveness, Doshisha University.
- The Climate Group (2010a): *China EV20 Report: Executive Summary - Market Transformation of Low Carbon Technology: Electric Vehicles*. China.
- The Climate Group (2010b): Market Transformation of Low Carbon Technology: Electric Vehicles. China. Online: http://www.theclimategroup.org/_assets/files/China-EV20-Executive-Summary_1.pdf.
- The Climate Group (2010c): Outlook for energy saving and new energy vehicles in the 12th Five Year Plan. China. Online: <http://www.theclimategroup.org.cn/publications/2010-10-Electric-Vehicles-Everywhere-by-2020.pdf>.
- The Climate Group (2011): Delivering Low Carbon Growth. China. China: The Climate Group. Online: http://www.theclimategroup.org/_assets/files/FINAL_14Mar11-TCG_DELIVERING-LOW-CARBON-GROWTH-V3.pdf.
- Wan, Z./Li, F. (2010): Alliance drives promotion of electric cars. Beijing: China Daily. Online: http://www.chinadaily.com.cn/business/2010-08/19/content_11173784.htm (accessed: 19.08.2010).
- Wietschel, M./Dallinger, D. (2008): Quo Vadis Elektromobilitaet?, *Energiewirtschaftliche Tagesfragen*, 12.
- Yun, Q. (2011): *Report on the Development of electric vehicles in China. Unpublished report by the Institute of Scientific and Technical Information of China (ISTIC)*. Beijing: Institute of Scientific and Technical Information of China (ISTIC).