Promotion Models and Achievements of New-energy Automobiles in Shenzhen

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Abstract. As one of the pilot cities in China for demonstration and promotion of new-energy automobiles, Shenzhen, driven by the "two engines" of the government and the market, has made swift progress in promotion of its new-energy automobiles. This paper analyses Shenzhen’s governmental promotion policy concerning new-energy automobiles, summarizes Shenzhen’s commercial models for promoting new-energy automobiles, and is expected to provide reference for other provinces and cities to promote new-energy automobiles.

1. Introduction

Accelerating the development of new-energy automobiles is not only an important measure for China to tackle climate change but also an important opportunity for China’s automobile industry to catch up with and surpass the international level and achieve leapfrog development. To Shenzhen, the new energy industry that highlights new-energy automobiles is an important part of low-carbon economy, and promoting new-energy automobiles is beneficial for developing low-carbon economy and fostering new economic growth points, and has important practical significance to adjusting and optimizing the industrial structure and to developing low-carbon economy.

What’s more, developing new-energy automobiles can also effectively alleviate the air pollution in Shenzhen, and is beneficial for building an eco-city. Shenzhen has a huge number of vehicles, and vehicle exhaust emission has become the main source of urban air pollution. Using petroleum-fueled automobiles cannot fundamentally solve the problem of CO2 emission, while the demonstration and promotion of new-energy automobiles can effectively improve urban air quality [1].

However, compared with traditional automobiles, new-energy automobiles’ high costs, inadequate auxiliary facilities, and consumers’ lack of knowledge of new-energy automobiles have become a hindrance for the promotion of new-energy automobiles [2]. In the process of promotion, the role of the government is particularly important, as the government can implement demonstration projects in key fields, offer subsidies to motivate individuals, social organizations and enterprises to buy and use new-energy automobiles, or introduce innovative commercial models to promote new-energy automobiles [3].

2. Promotion Models

2.1. Governmental Promotion
2.1.1. **Doing a good job of demonstration and promotion in three major fields.** Promotion of new-energy automobiles in Shenzhen can be carried from the following three aspects: 1. Intensive launch and vigorous promotion of the use of new-energy automobiles in the field of buses and taxies; 2. The government should take the lead, by means of lease and purchase, in using new-energy automobiles as official vehicles; 3. Preferential policies should be formulated to encourage individuals, social organizations and enterprises to buy and use new-energy automobiles.

2.1.2. **Building an auxiliary infrastructure system.** While promoting new-energy automobiles, Shenzhen actively improved the auxiliary infrastructure system and created an environment for using automobiles, laying a solid foundation for further promotion. By scientifically formulating design specifications and technical standards, Shenzhen made full use of its land resources and existing stations, reasonably planned the layout, accelerating the formation of a network system featuring public transport, public service and social charging stations (piles).

2.1.3. **Promoting demonstration and application at five levels.** In the process of promotion, according to its regional function positioning, Shenzhen focused on promoting the demonstration and application at five levels: demonstration region, demonstration route, demonstration vehicle team, demonstration community, and demonstration equipment.

2.2. **Commercial Model**

2.2.1. **In the field of public services.** In response to such problems of new-energy automobiles as the high acquisition price, and mismatch between power battery’s life and automobile’s service life, Shenzhen adopted a “financial leasing, automobile-battery separation, charging-maintenance combination” model, solving the fund pressure arising from intensive launch of new-energy buses and construction of charging facilities in a short period of time.

Specifically, "financial leasing” indicates that the charging facilities operator cooperates with a financial leasing institution, and provides a bus company with financial leasing services of all-electric buses without batteries (excluding power batteries) or hybrid buses (entire automobile), and collects the principal and interest by installments as per an interest rate not higher than the bank loan interest rate of the same period. The bus company’s purchase money shifts from one-off payment to payment by 8-year installments, which can effectively alleviate the bus company’s fund pressure. In addition, because the all-electric bus’s selling price is far higher than that of traditional petroleum-fueled automobiles, automobile and power battery can be sold separately. Using the “automobile-battery separation” model, the financial leasing institution buys the automobile and then, through financial leasing, supplies to the bus company, and the power battery is afterwards bought by the charging facilities operator, which can further ease the bus company’s fund pressure. The charging facilities operator buys the power battery and then invests in and operates the charging facilities, ensuring that the power battery’s life matches the bus’s service life; meanwhile, it provides charging service, gradually recovering the investment cost by collecting a charging & maintenance service fee, and such is “charging-maintenance combination”. According to this model, the bus company only needs to bear two expenses, one is financial leasing fee paid to the financial leasing institution, and the other is charging & maintenance service fee paid to the charging facilities operator.

By adopting this model, Shenzhen successfully realized preliminary growth in the scale of all-electric buses. Whereas, in such a model, the bus company is under a heavy operational burden, which restricts further expansion of promotion and application scale, and therefore further adjustment and improvement are urgently needed, so as to make the promotion and application work sustainable.

Afterwards, on the basis of improving the existing “financial leasing, automobile-battery separation, charging-maintenance combination” commercial model, Shenzhen began to try promoting a “financial leasing, double-lock and win-win, charging-maintenance combination” commercial model. First, by reducing the number of on-board power batteries and enlarging bus passenger space, it realized
complete-automobile lightweight design, improved vehicle wading ability and climbing ability, and thus reduced the overall cost of vehicles. Second, mobile energy storage & charging vehicles were used to recharge all-electric buses for each one-way running route, thereby ensuring that all-electric buses could, according to the bus company’s operation requirements, achieve effective operation. Mobile recharging has many merits, for instance, it does not need to occupy extra land resources, and can also reduce public-transport vehicles’ invalid round-trip mileage for the sake of battery charging. This commercial model makes full use of the power grid’s off-peak electricity, locks the government subsidies expenditure and the corporate operating cost and risk while meeting bus company’ operational needs, thereby achieving all-win and rapid common growth.

2.2.2. In the field of private automobiles. To further promote the new-energy automobiles in the field of private new-energy automobiles, based on complete-automobile sales supplemented with complete-automobile lease, Shenzhen explored and launched such innovative models as time-sharing lease and car-sharing. Complete-automobile sales indicates that the consumers purchase the automobile and the power battery at the same time, the one-off payment amount of which is big and the economic burden is great. Using the leasing model, an automobile lessor purchases electric automobiles equipped with batteries from the manufacturer, and provides medium- and long-term lease service, and thus the lessor can enjoy the automobile purchase subsidies of governments at all levels, and the consumers only need to pay the automobile rental, charging fee, and routine repair & maintenance costs, the economic burden of which is small. Time-sharing lease and car-sharing are a newly emerged model, and the automobile lessor provides a ready-for-use automobile lease service whose charge is calculated by the hour [4]. By assigning one automobile to different users in different time periods, encouraging short-time car rental and end-to-end car use, and forming resource sharing, it can effectively reduce the demand for downtown parking space [5]. As for the new-energy automobiles time-sharing lease business, Shenzhen set time-sharing lease indicators and released them in the form of bidding, and four companies are determined to conduct this business.

2.2.3. The auxiliary infrastructure system. Shenzhen used franchising to introduce social capital into the auxiliary infrastructure investment and operation, thereby stimulating the motive power of market development and reducing the financial pressure and project risk. Meanwhile, in the franchising period, the charging facilities operator can enjoy the preferential policies of free use of government-allotted land to build charging facilities, increasing the profit margin and ultimately achieving a win-win situation.

3. Progress and Achievements
Since 2008, Shenzhen’s promotion of new-energy automobiles went through four stages, the first stage is the preliminary stage of promotion and application in 2008; the second stage is the demonstration, promotion and application of new-energy automobiles in 2009-2011 when the Universidad was held in Shenzhen; the third stage is 2013-2015, when promotion and application achieved leapfrog development; the fourth stage is 2015 to now, during which period new-energy automobiles are promoted and applied on a large scale.

By the end of 2016, Shenzhen had launched 67,680 new-energy automobiles of various types, including 16,269 new-energy buses, 5,436 all-electric taxis, 10,561 new-energy logistics vehicles, 1,567 new-energy commuter vehicles, 25,764 new-energy private cars, 8,083 new-energy rental vehicles, and 181 other vehicles. In the meantime, Shenzhen vigorously promoted the construction of the auxiliary charging facilities, and by the end of 2016, it had built more than 195 centralized charging stations and more than 25,000 charging piles.
Table 1. Promotion and application of new-energy automobiles in Shenzhen.

| Vehicle Type                  | 2013  | 2014  | 2015  | 2016  | Cumulative Total |
|------------------------------|-------|-------|-------|-------|------------------|
| New-energy bus               | 1000  |       | 3616  | 9638  | 16269            |
| All-electric taxi            | 51    | 50    | 1585  | 3001  | 5436             |
| New-energy logistics vehicle |       |       | 8216  | 2345  | 10561            |
| New-energy commuter vehicle  | 153   |       | 962   | 452   | 1567             |
| New-energy private car       | 880   | 3465  | 7246  | 12760 | 25764            |
| New-energy rental vehicle    | 6981  |       | 1102  |       | 8083             |
| Other vehicles               |       | 2     | 117   |       | 181              |
| Total                        | 1931  | 3668  | 28608 | 29415 | 67680            |

4. Conclusion

Shenzhen has done a lot in infrastructure construction of charging piles for new-energy automobiles, as well as the promotion, demonstration and application of new-energy automobiles. Shenzhen proposed such innovative commercial models as “financial leasing, double-lock and win-win, mobile recharging, charging-maintenance combination” and “complete-automobile lease, time-sharing lease, car-sharing”, breaking the predicament in new-energy automobiles promotion, and finding a new path for Shenzhen’s new-energy automobiles promotion work.

With the further development of new-energy automobiles, Shenzhen should continue to promote the marketization of new-energy automobiles, forming new models for construction of new-energy automobiles, operation and maintenance featured by “multilateral participation, mutual benefit”, ensuring the sustainable development of the industry.

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