Front. Eng. Manag. 2018, 5(2): 268–275
https://doi.org/10.15302/J-FEM-2018058

RESEARCH ARTICLE

Zhengdong YANG, Feng JIN, Shiyu DU, Jingwen LI

Formation of free-charging industry alliance for new energy vehicles

Abstract At present, the further development of new energy vehicles industry is hindered by limited consumer's participation or capital investment. Therefore, a new multilateral model of cross-industry alliance needs to arise. The advanced charging technology of Internet-distributed mobile energy can link up with many market participants closely and form an effective and multilateral win-win cross-industry alliance. This new industry alliance can realize unexpected multiple goals, for example, (1) consumers who have purchased new energy vehicles can avail free charging; (2) potential vehicle buyers can be encouraged to use new energy vehicles; (3) the new energy vehicle manufacturers can expand their production scale; (4) the new energy vehicles sellers (4S shop) can expand their sales volume; (5) large shopping malls can attain more income; (6) financial institutions can absorb more deposits; (7) governments can further promote low-carbon traffic. This article analyzes the cross-industry alliance and its forming mechanism.[1)]

Keywords industry alliance, mobile energy, new energy vehicles, free charging, low carbon

1 Introduction

In the current wave of technological innovation, Chinese government has repeatedly proposed that an engineering and technological innovation can give birth to an industry and even affect and change the world. Further, the integration of information technology, biotechnology, new energy technologies, new materials technology, and so on, are triggering a new round of technological and industrial revolution. Internet-distributed mobile energy is one such engineering and technological innovation, which belongs to the typical strategic emerging industries that involve the Internet, new energy vehicles, new materials, and other emerging industries that are linked to popular economic issues such as big data analysis and the sharing of economic data that have recently emerged. The rise and development of Internet-distributed mobile energy can directly affect the traditional industrial alliance and change the way energy is consumed; furthermore, it tends to greatly promote economic development, social progress, and environmental improvement, and ultimately enables people to enjoy the dividend of the energy revolution.

Internet-distributed mobile energy has changed the traditional manner of energy use; however, it is not only a forward-looking concept but has been piloted with national promotion in China's coastal cities, especially Shenzhen and Dongguan in Guangdong. Energy saving and emission reduction in the field of transportation is a key to low-carbon transformation. Through the low-cost formation of Internet-distributed mobile energy industry alliance for the free charging of new energy vehicles, China can take advantage of the technological revolution and take lead in the era of innovative energy consumption.

Received July 15, 2017; accepted December 25, 2017

Zhengdong YANG, Feng JIN (✉), Shiyu DU, Jingwen LI
School of Economics and Management, Beijing University of Technology, Beijing 100124, China

This work was funded by the China Scholarship Council.

2 Literature review

2.1 Industry alliance

From the end of the 19th century to the beginning of the 20th century, "Cartel, Syndicate, and Trust" were all developed from industry alliances. Although they were criticized for the damage caused to society, they promoted the development of the entire industry.

Since then, researchers have conducted several studies on industry alliances. So far, foreign scholars have performed a detailed analysis of the definition, formation mechanism, and organizational structure of industry alliances: Williamson (1985) argues that an industry alliance is located between the market and the enterprise/organization, and it has a mixed governance structure. Gulati (1995) argues that an industry alliance is a form of communication initiated by an independent company for sharing, exchanging, or cooperating with other companies. Other scholars believe that the motive of formation of an industry alliance is to reduce risk, share R&D costs, reduce life cycles, get access to technological opportunities and hidden knowledge spillovers, get access to new markets, and adapt to the changes in the market structure (López, 2008; Mowery et al., 1998; van Dijk and Weggeman, 2003).

With the refinement of market segmentation in labor, people gradually realize that second-tier enterprises rely on products; however, truly first-class enterprises rely on knowledge and standards. The research hotspots of industrial alliance focus on knowledge transformation and innovation, trust, technical standards, and management standards. Makri and Lane (2007) study the influencing factors of technological innovation and knowledge transformation in industry alliances.

As strategic industry alliances realize the technical standards of market diffusion, the technical standard advocates began to explore a series of issues such as "the impact of the Union on technical standards," "how to achieve technical standardization through alliance," and so on (Abrahamson and Rosenkopf, 1997). Chinese scholars mainly focus on the motives of alliances, their performance and ability, technological innovation, and knowledge management. Xu and Long (2010) argue that there is a huge gap between China's enterprises and foreign companies in the context of risk management, and rational trust fails to guide the behavior of enterprises effectively. Some scholars study the influencing factors of multiple affiliate performance, such as reputation, relational rent, and partner selection (Hu, 2007; Xue and Zhang, 2010; Song, 2000). Zhou et al. (2011) argue that an industry alliance provides a channel and platform for enterprises to acquire knowledge, whereas knowledge sharing leads to conflicts of interest among independent enterprises.

Therefore, it is not enough for industry alliances to sustain based on technology sharing. An industry alliance is not the purpose, but the means. Overall, the ultimate goal of an industry alliance is to attain mutual benefits.

2.2 The new energy vehicles industry

The new energy vehicles industry is still in its initial stage. Although some countries have set up a number of new energy vehicle industry alliances, generally speaking, there is still a gap in the existing research on such alliances. Lasse F(2017) thinks that the pace of transition depends on the market uptake of new technology and on vehicle turnover. Gerad M, Thomas E (2017) argue Average annual savings generated by vehicle-to-grid are small but positive. Chinese scholars mainly focus on three aspects: (1) the comparison between the developmental strategy of new energy vehicle industry alliance in China and other countries and then put forward their own ideas about development and countermeasures; (2) the mutual influence between the new energy vehicle industry alliances and technological innovation; (3) the problems that appear in the development of new energy vehicle industry alliances. Zhang and Leng (2011) study the organization and management of the new energy automotive industry technical alliance in the United States and Japan and showed that the government should be highlighted in the industrial alliance and take the leading role of science and technology planning. Zhang and Zhao (2014) consider the differences in development between China and the United States as an entry point, analyzing the differences in the development of the new energy vehicles industry, such as targets, goals, means, and logic. Liu and Gao (2011) discuss the technology development trend of the new energy vehicle industry alliance in China, consisting of three aspects, the technological innovation platform, the selection of alliance partners, and the organizational management innovation. Meanwhile, they point out that in the future, scholars should do more in the technological innovation, management system establishment, knowledge transformation, and standardization in China's new energy vehicle industry alliance (Liu and Wang, 2016). Jin (2011) proposes that the new energy automotive industry alliance is independent in various regions and in need of unified planning and management. Further, the enterprise cooperation is not enough in the alliance.

In summary, research in the current domestic theoretical circle on the new energy automotive industry alliance is mainly focused on the same industry. On the contrary, achievements on the cross-industry alliance business model is currently scarce. Therefore, this research is mainly focused on the current Internet-distributed mobile energy and puts forward the ideas for the formation of a cross-industry alliance, which is mainly based on the motive of knowledge and technology sharing, and explores how free charging through the union of new energy vehicles enterprises can be realized to gain multiple dividends. These dividends imply that car consumers will buy electric vehicles, electric car manufacturers will produce more cars, electric 4S shops will gain more orders, hotels and malls will increase their operating income, commercial banks will absorb more deposits, and the government will achieve the expected low-carbon traffic transformation.

3 Present situation of the new energy automotive industry alliance

3.1 Category of new energy automotive industry alliance

The Beijing New Energy Vehicle Industry Alliance officially began to operate on March 13, 2009, which marked the first Chinese vehicle industry alliance that was formally established. Since then, the municipality of Chongqing and some provinces, like Shandong, Henan, set up their own new energy vehicle industry alliance. Currently, the number of new energy vehicle industry alliances is more than 10.

China's new energy vehicle industry alliances can be divided into four categories: (1) established by national organizations, which includes the central enterprises electric vehicle industry alliance established on August 18, 2010, and the new energy power automotive industry technology innovation strategic alliance of China established on July 20, 2016, in Beijing; (2) established in respective local regions, which makes the majority of alliances; (3) established by domestic and foreign enterprises, known as international vehicle industry alliances, such as Sustainable New-energy International Alliance established by Fukuda Automobile, IBM, and four other Chinese and foreign companies; (4) established by enterprises in the vehicle industry, such as the TOP 10 electric vehicle industry alliance.

3.2 The main features of the new energy automotive industry alliance

Danny Harvey L D (2018) points out advanced HEVs (hybrid electric vehicles) and PHEVs(plug-in hybrid electric vehicles) could have 3–4 times less fuel use per km driven. Safari M(2018) shows battery electric vehicles need strong policy support. Indeed, the establishment of China's new energy automotive industry alliance is strongly supported by local governments. For example, the central enterprises electric vehicle industry alliance received 13 billion CNY startup capital when it was first established. Changan Group holds 65% of the shares in Chang'an New Energy Vehicle Company, and a company that is controlled by Chongqing Municipal Science and Technology Commission holds the remaining 35% of the shares. During the inauguration, the local governments announced that they would provide one billion CNY as financial support to the industry alliance and offer capital subsidies for enterprises that move to the new energy vehicle production base. Relevant departments in the Jilin province would provide special funds for the industry alliance for R&D projects of key components, project subsidies for the demonstration and implementation of operations. Relevant departments in Chengdu would support the alliance to carry out important industrial technology innovation activities, and, at the same time, provide directed support for the industry alliance in the form of financial products, science and technology loans as well as technological research and commercialization of the achievements. So far, China's new energy vehicle industry alliance is still in the initial stage. Therefore, the development of the alliance will be strongly promoted by the governments.

Universities and research institutions are highly engaged in most industrial alliances. Apart from the TOP 10 electric vehicle industry alliance, the central enterprises of the electric car industry alliance, and the National Alliance of Sustainable New Energy, the rest of the alliances have universities and research units. Some universities have also joined a number of alliances, such as Tsinghua University that has joined the Beijing New Energy Vehicle Industry Alliance and the Guangdong Provincial Electric Vehicle Industry Research and Innovation Alliance at the same time. The participation of universities and scientific research institutions makes the alliances more powerful. Enterprises could take advantage of scientific research to enhance their technical level or develop new products; therefore, universities and enterprises could complement each other and share their resources, reduce R&D costs, enhance scientific research strength, promote scientific and technological research, and commercialize their achievements.

3.3 The development bottleneck of the new energy vehicle industry

According to the statistics of vehicle registrations, the production of China's new energy vehicles was 32800 units in September 2015, which is twice the number of units produced in the previous year. Among them, the production of pure electric cars was 13300 units, which is thrice the number of units produced in the previous year, the production of plug-in hybrid energy cars was 5641 units, which is a year-on-year rise of 138%, the production of pure electric commercial vehicles was 11,400 units, which is four times the units produced in the previous year, the production of insert electric hybrid energy commercial vehicles was 2429 units, which is a year-on-year rise of 22%.

Based on the vehicle industry planning by the Ministry of Industry and the development trend of the vehicle market, the promotion of new energy vehicles has received great support from policymakers and the market. In the near future, new energy vehicles are expected to play a significant role in the automobile market. Due to the further increase of market demand, the driving force of the new energy vehicles will become a dual driving force that will be policy and achievements, and this trend will continue and become a new force in the market segment. However, the new energy vehicle owners have found that

the lack of charging facilities have become the biggest obstacle to the further development of new energy vehicles. It is difficult for the current charging facilities to support the increase in new energy vehicles. In addition, further construction of charging facilities will be more difficult because the construction cost of charging facilities in old residential and active business districts is expected to be much higher in the future than the existing construction costs. Therefore, whether the need for charging can be satisfied is a problem that potential consumers worry about.

Thus, "charging difficulty" is the biggest concern for people who will buy new energy vehicles. Meanwhile, it is also the biggest obstacle for the promotion of new energy vehicles.

4 The key elements of the formation of the new energy vehicles free-charging industry alliance

4.1 Definition of modality of the industrial alliance

According to the practices of domestic and foreign industry alliances, an industrial alliance is a inter-enterprise organization in a market-oriented economy, which is set up to solve a specific industry problem and realize a win-win situation. Usually, an industrial alliance has four basic characteristics: (1) it is an inter-enterprises organization, (2) it has specific industrial objectives, (3) it has a specific duration, and (4) it can create conditions for industrial development. Based on the inter-enterprise cooperation in an industry alliance, the practice areas of the industry alliance can be divided into five categories: (1) cooperative industry alliance of the industrial chain, (2) cooperative industry alliance of R&D, (3) industry alliance of technical standards, (4) cooperative industry alliance of the market, (5) cooperative industry alliance of social rules.

Some cooperative industry alliances can improve the industrial chain cooperation, which is based on the vertical cooperation of industrial enterprises but does not rule out the participation of competitive enterprises in some parts, such as China's TD-SCDMA (Time Division-Synchronous Code Division Multiple Access), which is a typical cooperative industry alliance of the industry chain. Some cooperative industry alliances can promote the industry's common technology, such as the R&D cooperative industry alliance that Japan and the United States have established in the semiconductor industry. Furthermore, some cooperative industry alliances can develop industrial technical standards; for example, in 1997, major international electronic manufacturers and US content providers cosponsored the DVD technology standard alliance.

In addition, a market cooperation industry alliance can expand and utilize the market jointly. The most important feature of this industry alliance is horizontal cooperation. The new energy vehicle free-charging industry alliance discussed in this research belongs to this category.

4.2 Selection of the front-end charging technology

The formation of free-charging industry alliance for new energy vehicles is in need of advanced technology as a guide; it should be noted that the front-end charging technology in this research refers to the distributed mobile energy charging technology, which is based on mobile-distributed power generation technology via the combination of energy storage, control, information communication, and other technologies to achieve a portable, all-weather, high-efficiency energy supply. The progress of mobile energy over traditional energy is similar to the functional progress of mobile phones over traditional phones. At present, there are mainly two types of mobile energy: one is the traditional general type, such as the well-known mobile power, solar charging bag, wearable mobile solar film power generation, which has a favorable industry development trend; the other type is the intelligent embedded mobile energy system, which is mainly applied to personal electronic information equipment, outdoor supplies, vehicles including aerospace vehicles as well as the "distributed hydro-hydrogen generator" that can run independently to charge a tower without the national grid. In all modes of transport, electric vehicles are the most important application of the mobile energy market, because the current global electric car ownership is more than 400000 units.

4.3 The development of cutting-edge charging technology

Internet-distributed mobile energy is a new technology compared to Internet-distributed energy. Mobile energy is a new industry, similar to the emergence of mobile communications and the Internet that have changed people's lifestyle and the way they communicate. The shift from traditional centralized power supply to individual decentralized power supply is a revolution in energy utilization, which will provide energy everywhere.

It is the organic integration of "Internet + Mobile Energy," whose energy source is the distributed power generation technology with the help of intelligent communication technology, which can realize the all-weather, point-to-point, and efficient supply of energy. Thanks to the drive of "Internet +," which can be combined for use in many traditional industries or lifestyle products to achieve a transformation in production and lifestyle as well as to upgrade and remodel the original industry and products.

Effective physical distribution is the basis of the economic benefits of distributed mobile energy; therefore, Internet-distributed mobile energy has many characteristics of the energy Internet. It is also an innovation of the

traditional energy Internet. Energy Internet uses advanced computer sensing and simulation technology to connect millions of energy-using equipment and machine terminal systems; thus, the material base of energy Internet is established.

However, big data mining technology and data analysis technology are the bases of Internet-distributed mobile energy. The application of advanced technology can help derive great value from Internet-distributed mobile energy: First, from the perspective of total energy consumption, Internet-distributed energy can promote a substantial increase in energy generation and consumption efficiency, reducing the greenhouse effect. Second, it can supply additional energy in regions where the national power grid cannot reach or where the cost of establishment of grid is too high, greatly reducing the use of human and material resources. Third, it can broaden the scope of human energy usage, enhancing the energy endurance capacity.

Unlike energy Internet's focus on the industry, Internet-distributed mobile energy will eventually move toward consumers and connect every family, thereby leading to a more intelligent family-living environment, more intelligent and humane community services, and more energy-efficient and convenient electric cars. The close contact with millions of households with Internet-distributed mobile energy will bring out greater imagination and infinite creativity in the future.

4.4 Comparison of mobile power generation technology

4.4.1 Water-hydrogen generation

A "water-hydrogen machine" is a raw material mixture of methanol and water. This machine can vaporize raw materials and catalyze and reform them, and then produce high-purity hydrogen by purification. An important advantage of this machine is that it is portable, and can be used with a wide variety of raw materials, and the hydrogen is ready to use once it is produced. It not only solves the problem of hydrogen storage and transportation but also greatly reduces the cost of hydrogen utility. A high-purity hydrogen machine, water and hydrogen powered base, water and hydrogen generators, water-hydrogen fuel cell modules, and a series of derivative equipment are all included in the product categories, providing more choices for the distributed power supply innovation. These products can provide stable mobile power to many places, such as communication base stations, residential areas, farms, remote areas for emergency rescue, and electric vehicles.

Because combustion is not involved in the power generation process of water and hydrogen devices, the energy conversion efficiency of methanol-water fuel can be more than twice that of traditional gasoline engines, while the cost of electricity generation is just one-third of that in the case of gasoline and diesel engines. Most of China's domestic small-scale generators are gasoline engines, whose life is generally three to five years, with their continuous operation lasting no more than 48 hrs and causing a great deal of environmental pollution; however, the life span of hydrogen and water generators is much greater than the former.

In addition, the machine has no pressure volume, except the alcohol water pump and fan for air supply; therefore, there is no problem of noise as in the case of conventional generator devices. It does not emit sulfur-oxide compound (SO_x), nitrogen-oxide compound (NO_x), particulate matter ($PM_{2.5}$), and other harmful materials, but only carbon dioxide and water. Therefore, water-hydrogen devices have the features of a mobile power supply, which is environment-friendly, energy-efficient, convenient with respect to availability of raw materials, and so on. It can charge electric cars and also serve as a domestic and commercial standby power supply.

4.4.2 Film power generation

Film power generation technology is a kind of photovoltaic power generation, which is currently a popular new energy technology; Hanneng Company is engaged in the business of film power generation. The essence of this technique is the direct conversion of sunlight to electrical energy through the electromotive force of the medium in the sun. Film power generation is similar to the photosynthesis process in plants, which can directly use sunlight to produce energy. The film is as thin as paper and easy to bend and carry.

The core component of photovoltaic power generation technology is a solar battery; the solar batteries presently available are of two types: the common crystalline silicon battery and film battery. Film battery has an amorphous silicon structure, whose most significant feature is its thickness ($\leqslant 1$ μm), less than 1/100 of the traditional crystalline silicon battery. In addition, the amorphous silicon structure film battery can be a good combination with buildings and with advantages such as low light requirement, so it owns a dominant position in the market.

However, the conversion efficiency and stability of film batteries are poor and require a large area of facility, which pose as challenges for the film battery's widespread use.

5 Establishment method of the new energy vehicles free-charging industry alliance

5.1 The central role of mobile charging pile

Because of features such as no environmental pollution, small size, high-energy efficiency and the ability to install it in the rear seat of electric vehicles, the mobile charging

pile is very convenient to move freely within a high-traffic city such as Beijing. It helps avoids the problem of high costs of land for fixing the charging pile. Cell phone apps such as "Didi", "Uber", or "Shenzhou" can call for the mobile charging pile through the Internet. Electric car users can download a dedicated app and use this app when they are in need of charging. Once the demanded data reaches the Internet, the mobile charging pile will response rapidly and quickly come to the client through the navigation system to charge the his/her car.

A mobile charging pile can help get rid of the dependence on the national grid's fixed charging pile. It uses an off-grid point distribution power supply to reduce the burden on the national grid. Furthermore, the installation is not limited to the power grid. It can charge quickly without causing any pollution by emission. The problems of charging facility construction for electric vehicles can be solved effectively, especially in the case of old residential areas that cannot install a charging pile. Meanwhile, it is particularly suitable for shopping malls and office buildings with a large flow of people; through the calculation of people and traffic, a mobile charging pile can be installed in these crowded areas in advance and withdrew after shutting down, which can greatly improve the efficiency of energy usage and reduce charging costs.

5.2 Free-charging business model

5.2.1 Formation of a cooperative win-win business model

Electric vehicle factories, electric vehicle 4S shops, electric vehicle owners, hotels and shopping malls, commercial banks, government agencies, and distributed mobile charging stations — these seven objects can work together to build a free-charging business system for the electric vehicles, and each object can benefit from this free charging system. A freely distributed mobile charging station is the core of this business organization; by connecting with every object, the final objective can be realized; that is, electric vehicle factories can produce more vehicles, electric vehicle 4S shops can get more orders, vehicle consumers will be more inclined to drive electric vehicles, hotels and shopping malls can increase their operating income, commercial banks can get more loans, and government agencies can obtain a satisfactory environmental effect. The essence of this business system is the most popularly shared economic model, that is, the enormous change that "Internet + distributed mobile energy" can bring to the current lifestyle of people through a real-time, accurate algorithm that is supplied by the Internet and a cloud computing platform, matching supply and demand effectively, and finally, creating multi-cooperative win-win business value.

5.2.2 Theoretical analysis of the cooperative and win-win business model

It is simple to understand the theoretical basis of the model in that a common building is the premise of sharing. The specific requirements of the model are as follows.

(1) Formation of a relationship between distributed mobile charging pile suppliers and electric vehicle manufacturers.

The establishment cost of a fixed charging pile that should be paid by electric vehicle manufacturers is generally 9000 CNY; they can transfer these funds to the distributed mobile charging pile providers, who promise to provide free charging service for electric vehicle clients within the warranty period.

(2) Formation of distributed mobile charging pile suppliers and electric vehicle 4S shops.

Distributed mobile charging pile providers can actively participate in the charging service provided by 4S shops, implementing the free policy to help 4S shops increase

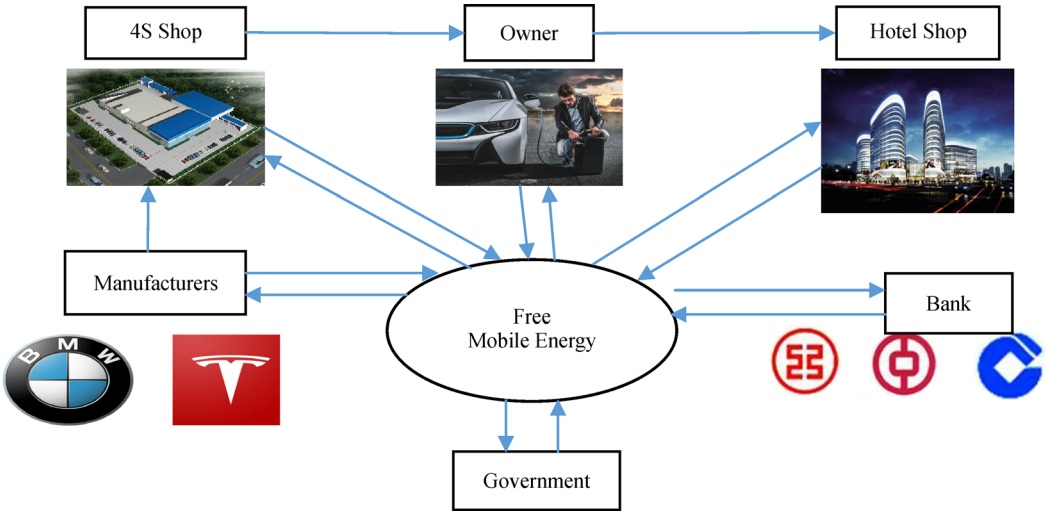

Fig. 1 Model of cooperative and shared commercial alliance

their sales. In turn, the 4S shops can authorize the mobile charging pile suppliers to implement charging services to promote the propaganda among electric vehicle owners, so that the mobile charger suppliers can establish more trust with electric vehicle owners.

(3) Formation of distributed mobile charging pile providers and electric vehicle owners

Mobile charging pile providers protect the charging requirements of electric vehicle owners during the car's warranty period, such as free charging within 100000 km. Electric vehicle owners only need to download the relevant free-charging app on their phones and inform the mobile charging pile providers about the specific charging locations through the Internet; mobile charging pile providers will go to the designated location for charging. In summary, electric vehicle owners will save fuel costs of 50–100 thousand CNY/vehicle annually compared to diesel locomotive owners.

(4) Formation of distributed mobile charging pile providers and hotel shopping malls

Because the flow of people is large in hotels and malls, there are more vehicles that may be temporarily parked. The following agreement between distributed mobile charging pile providers and hotels/malls can be achieved: providing a fixed location (such as parking spaces) to the distributed mobile charging pile providers during the day, wherein distributed mobile charging pile providers will send more electric vehicles with charging facilities to provide a free charging service according to the traffic flow. In this way, the commercial competitiveness of the mall or hotel will be improved, and the service of free charging will be propagated further.

(5) Formation of a relationship between the distributed mobile charging pile providers and the governments

The governments can make great contributions and efforts to promote the popularization of new energy vehicles and provide several financial subsidies. If the governments recognize the economic and social value of the distributed mobile charging pile, it will help promote and subsidize this new charging method. Therefore, the distributed mobile charging pile suppliers will accelerate market entry and reduce the pressure of energy conservation and emission reduction on the governments.

(6) Formation of a relationship between the distributed mobile charging pile suppliers and commercial banks

The distributed mobile charging pile suppliers will deposit the subsidies that come from electric vehicle manufacturers and governments in the commercial banks, and the investment income will be further invested in free charging services and research.

6 Conclusions and future research prospects

Co-construction is the basis and premise of sharing; therefore, high-quality sharing is not possible without a high level of co-construction. It is necessary to fully promote democracy, converge the wisdom of people widely, inspire the power of people greatly, and construct a vivid situation that everyone would like to be involved in for everyone to have a sense of accomplishment.

This research summarizes the development status and characteristics of the current new energy automobile industry alliance, discusses the feasibility of mobile power generation of water-hydrogen power generation and film power generation, and puts forward a free business model of new energy vehicle alliance based on Internet-distributed mobile energy. The technology of Internet-distributed mobile charging has emerged and matured, with features such as no environmental pollution, small size, high energy efficiency, and the ability to be installed in the rear seat. Internet-distributed mobile energy could make it very convenient for people to move in big cities having a huge flow of people and traffic such as Beijing, get rid of the problem of renting costs of a fixed pile, and could be used efficiently. In this model, electric vehicle owners, 4S shops, car manufacturers, governments, shopping malls, and hotels can achieve a cooperative win-win situation, which suggests that this model could be vigorously implemented and promoted.

This kind of free-charging cooperative win-win industry alliance is a typical way for the economy to upgrade itself in the present, which is an innovation of business strategy alliance. Its launch is bound to accelerate the development of the electric vehicle industry and change the way citizens travel. The formation of this alliance is an important decision to realize the dividends of multiple economic policies; at the same time, it should be recommended and promoted given that it is worth the wait.

References

Abrahamson E, Rosenkopf L (1997). Social network effects of the extent of innovation diffusion: A computer simulation. Organization Science, 8(3): 289–309

Danny Harvey L D (2018). Cost and energy performance of advanced light duty vehicles: Implications for standards and subsidies. Energy Policy, 114(3): 1–12

Gerad M, Thomas E (2017). Can parked cars and carbon taxes create a profit? The economics of vehicle-to-grid energy storage for peak reduction. Energy Policy, 106(7): 183–190

Gulati R (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. Academy of Management Journal, 38(1): 85–112

Hu Y (2007). Influencing factors of strategic alliance performance and theoretical evaluating model. Journal of Shihezi Univesity, 2: 55–58 (in Chinese)

Jin F (2011). Study on the development of China new energy vehicles

industry alliance. Dissertation for the Doctoral Degree. Wuhan: Huazhong University of Science and Technology (in Chinese)

Liu Y, Gao H (2011). Trends and measures of technology innovation in Chinese new energy vehicle industry alliance. Scientific Decision Making, 2: 1–8 (in Chinese)

Liu Y, Wang J (2016). Effects of knowledge transfer and technology innovation in industry alliance on the development of China's NEV industry. China Soft Science, 5: 1–11 (in Chinese)

López A (2008). Determinants of R&D cooperation: Evidence from Spanish manufacturing firms. International Journal of Industrial Organization, 26(1): 113–136

Makri M, Lane P J (2007). A search theoretic model of productivity, science and innovation. R & D Management, 37(4): 303–317

Mowery D C, Oxley J E, Silverman B S (1998). Technological overlap and interfirm cooperation implications for the resource-based view of the firm. Research Policy, 27(5): 507–523

Safari M (2018). Battery electric vehicles: Looking behind to move forward. Energy Policy, 115(4): 54–65

Song H (2000). Formation of relational rent in enterprise rent. Economy Science, 1(2): 2–27 (in Chinese)

van Dijk S, Weggeman M (2003). Knowledge sharing in technology alliances. Working Paper, (3): 24–30

Williamson O E (1985). The Economic Institution of Capital. New York: The Free Press

Xu A, Long Y (2010). Influencing factors of collaboration performance in competitive strategic alliance. Science & Technology Progress and Policy, 9: 1–5 (in Chinese)

Xue W, Zhang J (2010). Research on incentive mechanism of knowledge innovation in information system integration based on need-hierarchy mode. Management of Research and Development, 1: 82–89 (in Chinese)

Zhang J, Leng M (2011). How industrial technology alliances of new energy vehicles in US and Japan are organized and their implications for China. Bulletin of Chinese Academy of Sciences, 5: 543–551 (in Chinese)

Zhang Z, Zhao F (2014). The comparative study on the development strategies of the new energy automobile industry between China and America—based on the differences of the goal orientation. Studies in Science of Science, 4: 531–535 (in Chinese)

Zhou Y, Wang H, Liang X (2011). Counter-measure research of conflict of knowledge sharing among enterprise in alliance. Information Studies: Theory & Application, 10: 62–84 (in Chinese)