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Research on the Construction of New Energy Automotive Industry Innovation System based on Low-carbon Economy

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Abstract: The development of new energy automotive industry meets new opportunity and challenge with the emergence of low-carbon economy. The low-carbon economy not only has provided the development direction for the new energy automotive industry， but may also changed the fundamental nature of it simultaneously. What is more, it even can evoke deep-seated revolution of the automotive industry. The article has elaborated the elements, structure model and operation mechanism of the new energy automotive industry based on the low-carbon economy development pattern. Indeed, it provided a brand-new thought for our new energy automotive industry development.

Key words: Low-carbon economy; New energy automotive; Industrial innovation system

1. INTRODUCTION

After going through gathering economy, agricultural economy and industrial economy, human society will be faced with low-carbon economy, which is based on low-consumption, low-pollution and low-letting. In the view of sustainable development, there are many methods can be used to reduce the consumption of high-carbon energy resource，reduce the emission of green house, such as technical innovation，institutional innovation, industrial transformation and new energy resource development. So much so that there will be a great progress of human society after agricultural civilization and industrial civilization if we can reach the economic development form which is win-win between economic social development and ecological environmental protection.

In order to develop low-carbon economy, all countries now have been taking the appropriate measures to industry such as the EU's commitment according to the Kyoto Protocol to establishing emissions trading machine and the CDM means to pursue low-carbon economy. To realize the "post-crisis" sustainable economic development, developed countries particularly Europe and America promote energy efficiency, low emissions as the core of "low-carbon revolution", focus on the development of "low-carbon technologies", and carry on great strategic adjustment to each industry, to seize market opportunities and the industrial commanding heights. Low-carbon economy has been gradually changing the economic structure of the world.

Meanwhile, the development of the new energy automotive industry ushered opportunities and challenges. Low-carbon economy gives new energy automotive industry development direction; inducing a deep revolution in the fields of Organizational structure, industrial bounds, supply chain structure, mode of production, product cycle, market competition, competition mode, transaction speed and financial system. Countries participation in interna

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-tional competitive process industry has been driven to innovation-based stage, and the key of industrial competitiveness is the system integration of innovation. So the development direction of China's automotive industry is building a new energy automotive industry innovation system.

2. BRIEF INTRODUCTION OF NEW ENERGY AUTOMOTIVE INDUSTRY INNOVATION SYSTEM

2.1 The Connotation of the New Energy Automotive Industrial Innovation System

The basic connotation of the innovation system of new energy automotive industry can be interpreted as: On the basis of enterprises innovation, developing with the direction of low carbon, taking new energy automotive market demand as motive force, regarding new energy manufacturing enterprise, university, scientific research institution, governments at all levels as main parts of innovation system; Each part respectively realize technological innovation by means of interaction of the system structure and environment. These innovations include organizational innovation, management innovation, and policy system innovation. Thus the whole innovation of the new energy automotive industry can be realized; by the fusion between self-operation of the new energy automotive industry innovation and low-carbon economy development environment, the competitiveness of organic system for new energy automotive industry can be promoted.

3. STRUCTURE ANALYSIS FOR THE NEW ENERGY AUTOMOTIVE INDUSTRY INNOVATION SYSTEM BASED ON LOW-CARBON ECONOMY

3.1 The Structure Elements of New Energy Automotive Industry Innovation System

The new energy automotive industry innovation system which is based on the low-carbon economy contains five elements: participant elements, the policy environment elements, market demand elements, knowledge and technology elements, intermediary elements.

3.1.1 Participant elements

Participants mainly refers to the main subject of the new energy automotive innovation activities, including new energy automotive manufacturers, new energy automotive scientific and educational institutions, customers and government.

3.1.2 Intermediaries elements

The intermediary organ mainly means the connecting element of every main subject in the new energy automotive industry, it is a necessary condition of current technological innovation, including intermediaries which provide the new energy automotive industry support and service，such as auto finance companies, banks, industrial parks, achievements transferring departments.

3.1.3 Knowledge and technology elements

Industrial innovation mainly conducts technical innovation, and the knowledge is the foundation of technology innovation. The innovation of new energy automotive industry cannot do without the support of the new energy auto technology. At present the new energy automotive technological innovation mainly is the research and development of components and parts of new energy automotive, such as improving power fuel consumption, develop more durable of lithium-ion battery etc. In addition, the knowledge exchange and technical circulation between each participant in new energy auto industry also is very important.

3.1.4 Market demand elements

Market demand is the main determining force whether new energy automotive industry innovation can develop smoothly. Only industrial innovation adapted to market changes can be considered a successful innovation. The new energy automotive enterprise's production supplies must be formulated according to the market demand. And only innovation products are popularized to the market and coming into being certain demand, then it could make profits for enterprises. Demand plays an important role in industrial innovation systems.

3.1.5 Policy environments

By the views of Rothwell and Zegveld, innovation policy should include the scientific and technological policy and industrial policy. According to the influence of policy on science and technology activities, the policy environment can be divided into supply policy, demand policy and environmental policy. The government carries

on the intervention and the instruction, according to the trend of economy development and formulating relevant policies to the industrial innovation.

3.2 Analysis of Innovation System Model Of New Energy Automotive Industry based on Low-carbon Economy

The structural model of industrial innovation system refers to the combination or relationship patterns of all elements in this system. In the new energy automotive industry innovation system, new energy automotive enterprise is the subject of innovation; other participants are integral parts of innovation, knowledge and technology are the bases of innovation, the intermediary is the auxiliary of innovation, the policy environment is the guarantee of innovation, and market demand is the goal of innovation. This figure reveals the structural model of this system (Figure 1).

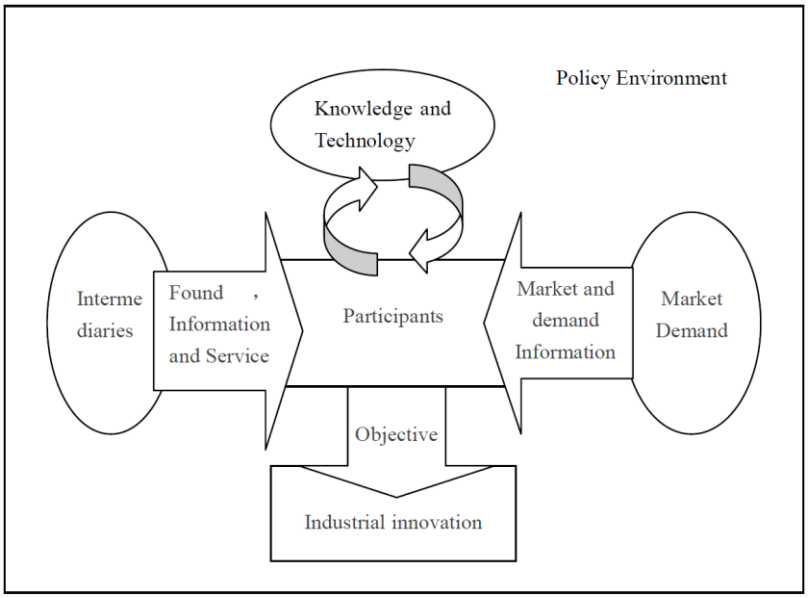

Fig. 1: Innovation System Model of New Energy Automotive Industry based on Low-carbon Economy

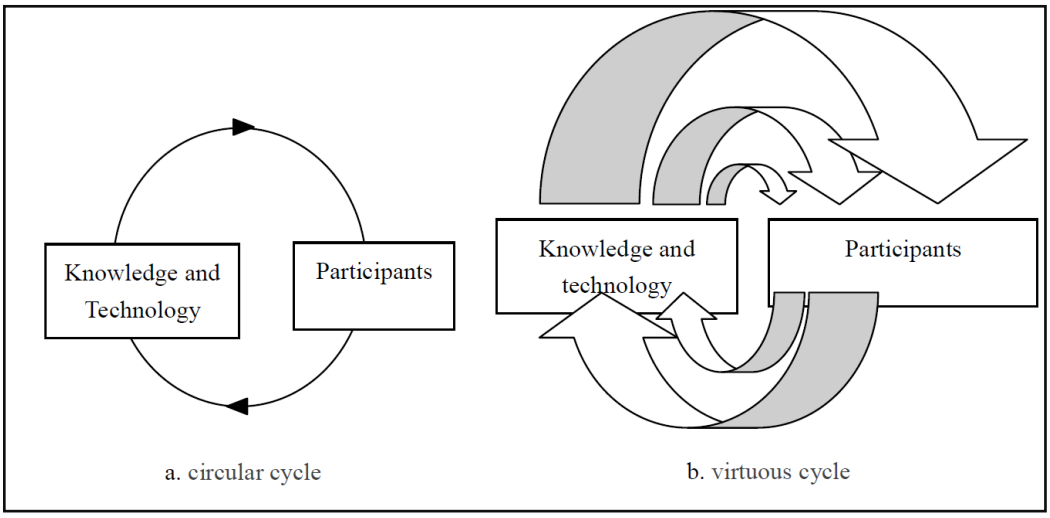

Fig. 2: "Knowledge-practice" Circle

From this figure, we can make clear that each element is closely linked. By interacting with other elements; the participants achieve their goal of realizing industry innovation and improving competitiveness. Among the elements, the intermediary connects with the participants by way of offering the fund, information and service. Participants convert personal original knowledge into knowledge and technology, constantly upgrading and integrating. In turn, knowledge and technology guide the participants. Their relationship can be described as conversion of Knowledge and practice, it is not a simple circular loop (Figure 2-a), but a spiral and virtuous cycle (Figure 2-b); the demand market is connected with the participants through offering the demand and information

of market to the participants; Policy environment formulates technical specifications to regulate intermediary, demand market and the participants, so the policy environment can affect on all other factors.

3.3 The Operating Mechanism of New Energy Automotive Industry Innovation System

That whether new energy automotive industry innovation system can function properly, and if this operation can make the industry the best performance, all depend on its operation course and operating mechanism. Operating mechanism is established with starting or ending of certain goals and certain demands or desires. It is the regulator of industrial innovation. If the mechanism can work well, it can effectively constraint, coordination, inspire each innovation subject's behavior. So that it is in good running condition. On the contrary, the behaviors of members within the industry are disturbed, leading to failure of innovation. Therefore, we must establish an effective operational mechanism of industrial innovation system to ensure the successful operation of industrial innovation system and implementation of common objectives

According to above discussion in many aspects such as systematic meaning, influence factor, system function, operating mechanism and so on, the article built the operating model of new energy automotive industrial innovation system, and this model is based on a low carbon economy (Figure 3).

Then we analyze concretely operating model of new energy automotive industrial innovation system which is based on low-carbon economy.

①New energy auto enterprise is the only venue to realize industrial innovation. From auto technological innovation to innovation technology industrialization, only through innovating new energy auto enterprises' products, productive technology or production equipment, and putting the products to market successfully, then the industry innovation may be completely formed. In this process, it also forms the new energy auto enterprise innovation system, along with institutional innovation, organizational innovation, cultural innovation etc.

②The innovation of new energy auto enterprise takes meeting market demand and the requirements of economic development as the starting point, and takes customers' purchase of innovation products as the end point. Demand market plays an important role in industrial innovation system; it confirms the feasibility of market about the new energy automotive industry innovation. Meanwhile, whether the new energy auto enterprise technology innovation can succeed or not in the market, or whether the market has the feasibility of market, all determine the developments of industrial innovation and enterprises' innovation.

③The development of science and technology is the base of knowledge technology innovation. Though auto industry is a typical manufacturing industry, its ability to absorbing the advanced scientific and technological achievements is unmatched than others. Partly, we can put the new energy auto industry's' development as an important symbol of measuring one country's industrialization level and scientific and technological level. So the innovation of new energy automotive industry must depend on the development of science and technology in whole society.

④Due to high investment and high risk possessed by scientific research in technological inventions and new technology products industrialization, support conditions provided by financial institutions and other intermediary institutions is quite important. The intermediary helps the research institution to sell research results to enterprises. Meanwhile, the intermediary institutions that specialize in finance and information services will also offer finance and information services to new energy automotive industry

⑤According to low-carbon economy development model, government formulates policy for new energy automotive industry innovation. First, on the basis of development needs of low-carbon economy, we guide the development of new energy automotive enterprise and formulate corresponding demand policies. Second, we should develop corresponding environmental policies to expand customers' requirements for new energy automotive products, Such as making purchase subsidy policy, public service infrastructure construction, carbon emissions standards, etc. In addition, we may lay down quite a few policies to ensure the healthy development of new energy automotive products, such as R & D standards, regulations for information and service standards and educational institutions.

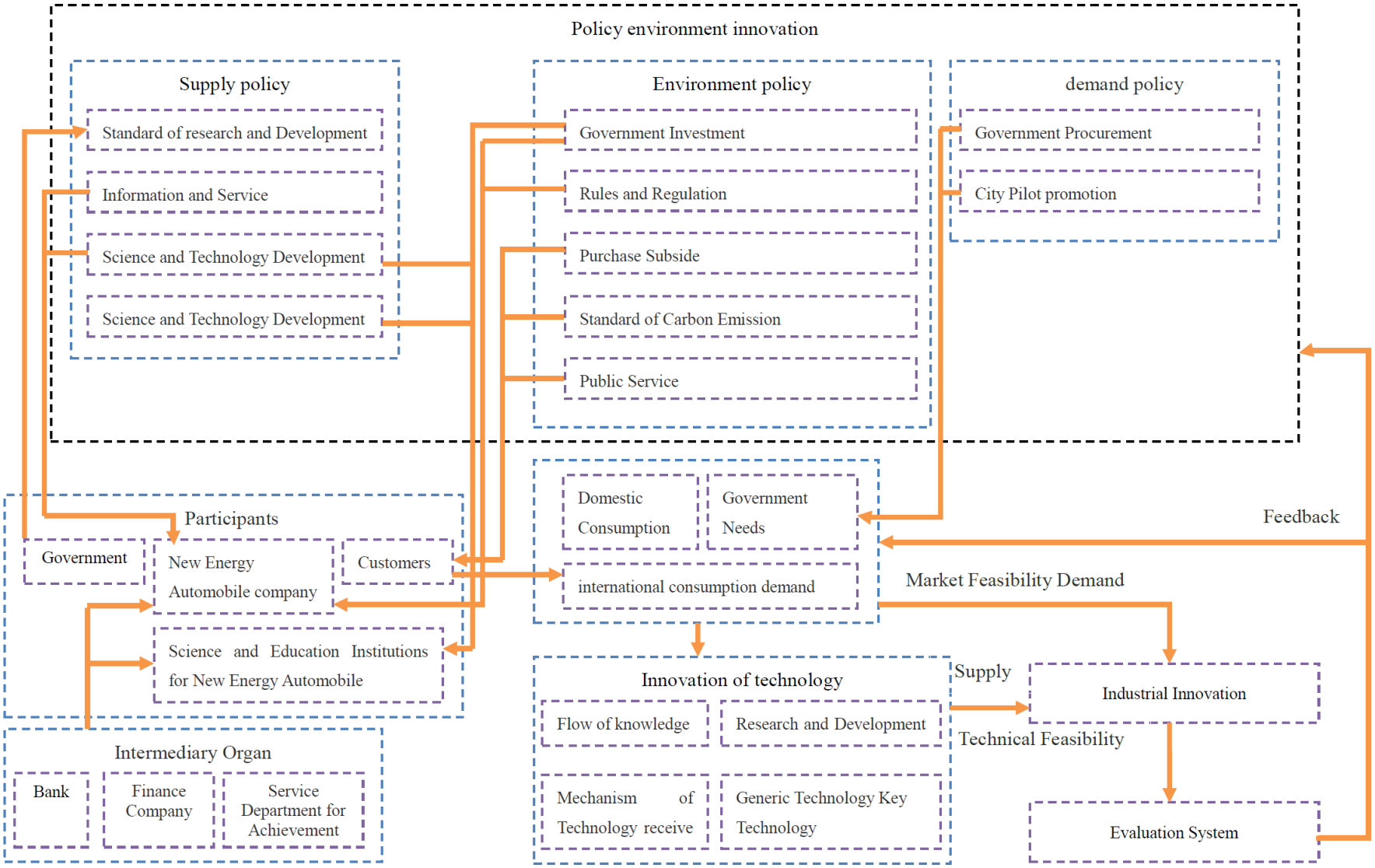

Fig. 3: The Operating Model of New Energy Automotive Industry Innovation System based on Low-carbon Economy

⑥when it comes to knowledge and technology innovation of new energy automotive, no matter a lot of new energy car enterprises jointly innovate or under the circumstances that the forerunners of innovation enterprise singly or the other car enterprises' imitate innovation, all will make the technological innovation spread. And the diffusion of technological innovation brings industrial innovation to practice.

⑦Individual new energy automotive companies may take the lead in innovation of new energy or more jointly innovate. They may get a high growth rate and achieve monopoly profit than other companies who are not innovation, quickly occupy the market and change the market structure. The enterprises participating in innovating at first may also fail, but the potential demand for this innovation of the market is very great, technology have the leeway for improvement. There will still have enterprises continue to innovate. It means the feasibility of market that are formed by demand has determined the development of technical feasibility that are formed by supply, and the development of technical feasibility reacts on the development of the feasibility of market.

⑧The combination of industry, academia and research is an important form of technological innovation and production industrialization. It enhance the existing innovation ability, also enables foreign enterprises to plunge to the automotive industry by technological advantage, so the foreign enterprises may get high profits, develop rapidly and continue to invest and research for keeping its technological advantage. So enterprises enter the positive circle, that is "leading technology - - high profits - - high investment for research and development - - leading technology".

⑨Industrial innovation system also includes evaluation system which can evaluate the ability of industrial innovation, by means of evaluation on system operation. We can constantly improve innovation elements and their links in the innovation system. Thus we form the lasting innovation course, make the new energy automotive industry an unassailable position in the fierce industry competition finally.

4. CONCLUTIONS

This paper mainly introduces the meaning of new energy automotive industrial innovation system, discusses the constituent elements of industrial innovation system, constructs the structure relation model, analyzes the operating mechanism of the new energy automotive industry innovation system. The article has analyzed the developing direction of new energy automotive industry from new visual angle, and has provided a new idea to adapt to low-carbon economy. That is to constructs the new energy automotive industrial innovation system.

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