

Analysis on the Operating Mechanism of City's Low Carbon Industrial Structure Adjustment of Hebei Province

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Abstract—This paper mainly analysis the driving force to the development of low carbon city in optimization and upgrading of the industrial structure, lists the practical experience and effects of implementing low carbon economy and making operating mechanism of industrial structure adjustment in developed countries, and then put forward the strategies on how to develop the operating mechanism of city's low carbon industrial structure adjustment of Hebei province.

Keywords—low carbon city; industrial structure; operating mechanism; Hebei province

I. INTRODUCTION

From the national strategic perspective, our government has issued a new policy: developing a low carbon economy after the circular economy. The policy aims to achieve the obligatory goal-per unit of GDP carbon emissions in 2020 should fall by 40% to 45% than 2005, and it has been incorporated into the national economic and social development of medium and long-term planning, and formulate the corresponding statistics, monitoring and evaluation standards. City, the center of social economic activities, brought together more than half of the world's population and the city's emission of greenhouse gas has reached to about 75% of global amount. The demand of city for resources and the expansion of carbon coverage area are far beyond the limits of what they can bear, which influence its continued development seriously. Low carbon city gradually become a space focus on a low carbon economy and low carbon social. Since the "low-carbon city" has been issued by the department of housing and urban-rural development and WWF (world wide fund for nature) in Shanghai and Baoding for the pilot, Zhuhai, Hangzhou, Guiyang, Nanchang, Guangyuan, Ganzhou, Wuxi and other cities also successively put forward the idea of building low-carbon city. Low-carbon city is considered to be the best choice for the sustainable development of city. In terms of the rapid development of industrialization and urbanization to intermediate stage, Hebei as a big energy big province walking a road of the city low carbon economy is the inevitable choice to transformate the mode of economic growth and optimize industrial structure.

II. THE DRIVING FORCE TO UPGRADE INDUSTRIAL STRUCTURE BEHIND THE TREND OF LOW CARBON CITY IN HEBEI PROVINCE

A. *Selecting a Template high carbon industries as leading industries*

In 2012, three types of industry in Hebei province as a share of GDP were separately 13.0:52.1: 34.9, and three kinds of industries of cities as a share of GDP are shown in table 1. The table 1 shows that in addition to Qinhuangdao, other cities economic growth depend on the second and the third industry. At present, Hebei province is in the period of rapid development of industrialization and urbanization, some high carbon industries are still supporting the economic development of Hebei leading industries. For example, steel, building materials, chemical and electric power and other leading industry of Hebei province are serious heavy chemical industries, but the third industry as low energy consumption industry developed slowly and unevenly. Including transportation storage, posts and telecommunications, wholesale and retail, catering industry occupy the main body status. By contrast, financial insurance, real estate and other modern emerging service industry share the low proportion [1].

Table I The proportion of three types of industry in 2012 ^[2]

City	The first industry	The second industry	The third industry
Shijiazhuang	10.3	49.6	40.1
Chengde	14.9	51.6	33.5
Zhangjiakou	15.1	41.8	43.1
Qinhuangdao	12.7	38.8	48.5
Tangshan	9.4	57.8	32.8
Langfang	12.1	53.4	34.5
Baoding	15.3	50.4	34.3
Cangzhou	12	48.2	39.8
Hengshui	18.9	50.8	30.3
Xingtai	15	56.6	28.4
Handan	12.3	53.9	33.8

B. *high carbide of energy structure*

Hebei province is the largest coal consumption in our country, and the coal in the energy consumption structure in Hebei has been accounted an absolute position. In the energy consumption structure of 2012, consumption of coal accounted for 92.51%, oil accounted for 6.21% and natural gas accounted for 1.21% of the total energy consumption. Because Hebei is rich in coal, but poor in oil and gas, combined with wind energy source, solar energy, nuclear energy, biological energy and low carbon energy have not yet formed the scale, the consumption of coal mine has been at the top. In the future a long period of time, the pattern of energy consumption is given priority to with coal still won't change. In 2012, comprehensive energy consumed by industries beyond some scale in hebei province achieved to 171.5963 million tons of standard coal. Among them, in addition to communication, gas, water industry, the rest are high carbon energy intensive and highly polluting industries, accounting for 89.75% of the industrial comprehensive energy consumption. From the energy consumption statistics in every city, Tangshan enterprises above some scale that energy consumption is smaller (less than 100000 tons of standard coal), the rest of the cities are high consumption city, as shown in table 2. In Hebei, city's economic development is based on high energy consumption and high carbon emissions, so energy conservation, emissions reduction and low carbon urban economy are imminent.

Table II Energy consumption from city to city in 2012

City	Energy	
	consumption of enterprises above some scale(10000 tons Of standard coal)	Energy consumption of per unit GDP
Shijiazhuang	10.3	1.537
Chengde	14.9	1.705
Zhangjiakou	15.1	2.121
Qinhuangdao	12.7	1.231
Tangshan	9.4	2.464
Langfang	12.1	0.893
Baoding	15.3	1.006
Cangzhou	12	0.989
Hengshui	18.9	1.009
Xingtai	15	1.825
Handan	12.3	2.144

In Hebei, energy consumption of per unit GDP is 1.64 tons of standard coal/ten thousand yuan which is higher than the average level of our country and locate in the eighth around our country, just belowing the Shanxi, Inner

Mongolia, Tibet and other 7 provinces (autonomous regions).Energy consumption of per unit GDP in Hebei province from city to city, Zhangjiakou, Tangshan, Handan energy consumption has seriously beyond the national average city. Visibly, low level of low carbon technology and low energy efficiency are barrier of the economic development in Hebei, besides the traditional mode of economic growth also makes carbon emissions continue to grow.

C. *high carbon lock-in effect*

The heavy chemical industry of Hebei province, such as electric power, petrochemical, steel and so on have become a pillar industry, and it is difficult to change in the short term, so it will bring more apparent carbon lock-in effect. Data shows that in 2010, the total electricity consumption reached 192.6 billion KWH in Hebei province, by contrast, in 2012, the number reached to 216.8 billion KWH. How to avoid the lock-in effect and future trouble in the process of development is an urgent and practical challenge.

D. *Extensive trade structure*

Hebei province foreign trade mainly rely on high consumption, high investment, low technical transformation, low additional extensive mode of growth. The trade structure in Hebei is that the proportion of manufactured goods is low; exports like high value-added content and high technology among manufactured goods are also small and poor competitiveness, especially in technology-intensive mechanical and electrical products, high-tech products ;exports of resource-intensive and raw material products are larger; give priority to with the labor-intensive and resource-intensive, the primary processed products, which reflects the Hebei foreign trade at a low level, extensive transition stage of development. Furthermore, this trade structure has already could not adapt to the current economic situation in Hebei province.

III. THE OPERATING MECHANISM OF CITY'S LOW CARBON INDUSTRIAL STRUCTURE ADJUSTMENT OF HEBEI PROVINCE

Through taking example by the practice of developed countries in low carbon economy and industrial structure adjustment mechanism, low carbon industrial structure upgrade should make efforts to coordinate position, knowledge structure and low carbon emissions in the case of high pollution, high energy consumption and high emissions. Such as informatization and knowledge-based, networked and intellectualized degree is not high to upgrade industrial structure low carbon will be the status of harmonization, knowledge structure, low carbon emissions direction.

A. *Carbon sink concept can be incorporated into the first industry, vigorously develop carbon industry*

Hebei as a big agricultural province is suitable for crops growth and has rich experience in afforestation and modern agriculture. Therefore, developing the farming and forestry which has a unique climate resources and biological resources can help to reduce the carbon dioxide in the atmosphere. In addition, Hebei province is one of the main distribution of grassland area in China, where the

grassland area is far greater than the forest area and carbon sinks total quantity is far bigger than the forest. An effective way to develop low carbon economy is vigorously develop ecological animal husbandry which could effectively take advantage of China's grassland carbon sink. In February 2010, our province environmental energy exchange was formally established in Shijiazhuang, that is the new exploration to promote low-carbon economy by means of market. Developed carbon sink industry can help Hebei to create loose environment for carbon trading system in international trade.

B. Low-carbon technology and traditional technology integrated into the traditional industrial system in order to low carbon use high carbon energy

Coal is the highest carbon energy among the carbon emission coefficient in energy consumption structure in Hebei province, and it has been in a leading position. At the same time, natural gas carbon is the least among these three kinds of fossil energy: coal, oil, natural gas. In the existing fossil energy, therefore, we should consider natural gas as the center to explore, exploit and develop, besides construct a low carbon demonstration power plant and increase support for this aspect[5]. In steel industry developed city such as Tangshan, we should optimize the industrial structure, compress traditional backward technology products and speed up the adjustment of product structure, so as to ensure that it is developed in the direction of high-end, deep processing, characterization. Additionally, it is necessary for Hebei to speed up the upgrading of process technology and equipment structure and establish steel industry development system with low carbonization.

Adding clean energy into the energy industry structure adjustment and decreasing carbon content in the energy structure, the key is to change the energy development of new energy industry. Hebei has a lot of clean energy resource, mainly including solar energy, wind energy, biomass energy, etc.

1) Solar photovoltaic power generation and heating

Hebei province has rich solar energy resources in the country, annual radiation dose 4.981 ~ 5.966 billion kilojoules per square metre, annual sunshine 2800~3000 hours in Zhangjiakou, Chengde and the east of Cangzhou. All these conditions enough to show that Hebei province has great potential in starting the solar photovoltaic power generation project.

2) Wind power generation

Zhangjiakou, Chengde, Qinhuangdao, Tangshan and Cangzhou coastal areas and Taihang Mountains and Yanshan mountain area have rich wind source, so these areas are very suitable for the development of wind power projects. The total reserves of wind energy resources in our province is about 74 million kilowatts. The wind power installed capacity of Hebei in the second place in our country.

3) Biomass power generation

Hebei has a wealth of straw resources. A plenty of crop straw and municipal solid waste can be used to generate electricity. To do it not only convert waste water to useful resources, and achieve the effect: reduce carbon emissions,

increase farmers' income and economic growth, increase employment.

4) Reclamation of coal mine, gas and methane gas

At present, the coal mine has build a batch of small coal bed methane power generation project in Hebei province. In the future, Hebei should focus on the list of coal mine methane emissions and start the technology research on recycling coal bed methane. Next, formulate economic policy to support for developing and using coal bed methane and promote international cooperation projects by using methane market-based mechanisms.

C. Develop low-carbon modern industry and promote the optimization and upgrading of the third industrial structure

The tertiary industry has become the channel for absorbing employment of the current and future in Hebei province(including Qinhuangdao is driven by the tertiary industry economic development).Therefore, guiding essential productive factors in modern service industry, such as modern logistics, research and design, financial insurance and information services, producer services project and so on producer services projects, in addition to cultural tourism, community service, commerce and trade circulation and leisure fitness and so on consumer services projects, will facilitate the interactive integration for service and manufacturing industry of Hebei. In order to develop modern logistics industry, Hebei should construct "area, two channels, three types of agglomeration zone" based on the situation of raw materials industry and important transportation hub. Specifically, build logistics industry area around Beijing and Tianjin, keep access open between logistics channel of east of Hebei (the port of Tangshan and Qinhuangdao served as it's tap) and central south of Hebei(the port of Huangye served as it's tap),and develop a logistics industry gathering area of transport hub, manufacturing base and commodity distribution center[6].

D. Other market mechanisms

1) Give rein to international cooperation mechanism

Draw lessons from foreign advanced experience on low carbon community and low-carbon city; carry out international exchanges and introduce advanced technology, in particular to strengthen cooperation with the European Union, the United States and explore new cooperation pattern for sustainable development of environment.

2) Establish the perfect government compensation mechanism

For those companies taking the lead in using low carbon technology, the government should give make up for the cost of fixed capital renewal fee when they update the backward production equipments. For those enterprises to carry on the independent innovation on low carbon technology, the government should establish innovation cost compensation mechanism.

3) Build positive market incentives

Carbon trading could bring the financial capital and the real economy together tightly and develop dynamic mechanism and operating mechanism of low carbon economy through the combination of virtual economy and real economy.

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