Industrial Development Layout and Competitiveness Evaluation Based on Correlation Analysis between Power and Industry

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Abstract. The change of industrial structure has a significant impact on energy consumption. The coordinated development between energy structure and industrial structure has a profound impact on the steady development of national economy and society. In this paper, focusing on the needs of industrial development layout and combining with the scenario of dual-carbon target constraint setting, a power-industry management analysis model is constructed, and a differentiated screening mechanism of industrial layout is realized under the three scenario Settings of dual-carbon target. According to the industrial development layout of Xinjiang, this paper studies the relationship between industrial development and energy and electricity consumption under different scenarios, selects the key industries according to the requirements of different scenarios, and carries out the scene comparison evaluation based on the industrial competitiveness evaluation. Finally, the paper puts forward specific suggestions from the perspectives of applying the coordinated layout of different scenes in stages, taking into account the coordination of regional layout, and striving for the practical linkage between industry and electric power.

1 Introduction

Since the reform and opening up, with the rapid development of China's economy, the energy structure and industrial structure are constantly changing. The change of industrial structure has a significant impact on energy consumption, and the coordinated development between energy structure and industrial structure has a profound impact on the steady development of national economy and society [1-2]. In the period of the 14th Five-Year Plan, driven by the energy revolution and the digital revolution, a large number of emerging energy technologies are accelerating their iteration at an unprecedented speed, becoming the driving force for accelerating the global green and low-carbon transition and bringing

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significant and far-reaching impacts on economic, social and industrial development. With the proposal of the dual-carbon goal, dual-control of energy consumption further puts forward more stringent requirements on the consumption of clean energy and the level of industrial energy use. In this context, the relationship between energy consumption, especially electricity consumption, industrial development and its medium - and long-term layout is more complex and profound, which has attracted further attention.

In terms of academic research, the relationship between power and industry has been a hot topic. It mainly focuses on 3 aspects: first, it focuses on the factors of economic growth and studies the relationship between energy consumption and economic growth based on industrial layout and industrial energy structure [3,4]. Second, it focuses on the change of industrial structure, studies the relationship between energy structure and industrial structure, analyzes the evolution relationship between the change of energy structure and the change of different industrial sectors [5], including factors decomposition method, Granger causality analysis, neoclassical economic growth model and other methods [6-8], and describes different research results through the division of industrial sectors and energy use varieties from different perspectives. Third, focus on energy consumption in key industrial areas, including the transmission path of industrial energy consumption, the relationship between the transfer of high energy consumption industries and energy economy, etc. For example, scholars analyze the influence on industrial energy consumption from 3 aspects, such as structure effect, technological progress and policy system, and focus on exploring the mechanism of action between industrial structure change and industrial energy consumption by using grey correlation method [9].

From the perspective of the research object and content, the current competitiveness analysis of specific industries in Xinjiang Autonomous Region focuses on the analysis of the historical data of a single industry in Xinjiang Autonomous Region. The objects are mainly the tourism industry, forestry and fruit industry, textile and clothing industry, and cotton industry, most of which are the research of Xinjiang Autonomous Region as a whole or the 14 prefectures of Xinjiang Autonomous Region, and the overall lack of horizontal comparison of multiple industries. There is also a lack of provincial-level comparisons for specific industries. Most of them are qualitative studies based on Porter's "Diamond Model" and other industrial competitiveness theories [10]. There is also a combination of qualitative and quantitative models on industrial competitiveness theory [11]. In addition, there is an empirical analysis of competitiveness evaluation index system for related industries based on relevant influencing factors.

It can be seen from literature that relevant power-industry correlation analysis studies mostly focus on the quantitative relationship analysis and development and evolution study of industrial structure and energy structure, and have little correlation with the analysis and evaluation of industrial layout development and competitiveness [12]. Under the new requirements of double carbon target, it is more necessary to re-examine and analyze the power industry correlation analysis and evaluate the industrial competitiveness.

This paper focuses on the requirements of industrial development layout, combined with the scenario of dual-carbon target constraint setting, studies the correlation between industrial development and electricity consumption under different scenarios based on power-industry correlation analysis, screens key industries according to the requirements of different scenarios, and evaluates the industrial competitiveness.

2 Model constructions

2.1 Scenario setting and description

In order to reflect the correlation between industrial layout and energy use level brought about by dual-carbon constraints, this report intends to set three scenarios for implementing carbon peaking and carbon neutrality policies to different degrees. They are as follows: Scenario 1 rapidly promotes the dual-control requirements of energy consumption; scenario 2 relatively steadily promotes the dual-control objectives; scenario 3 dual-control meets the minimum standards.

On the premise of meeting the basic requirements of the policy, the differences between the three scenarios are mainly reflected in the speed of the process of realizing the dual-carbon goal and the intensity of implementation. Among them, scenario 2, as the middle scenario, is consistent with the national two-carbon process. In scenario 1, compared with scenario 2, the degree of decarbonization is more radical and slightly faster than the national two-carbon process. It is mainly shown that the industrial structure changes faster, the output value of high-energy consumption industries peaks earlier, the utilization of CCUS and the distribution of hydrogen energy are advanced, and the industrial electrification rate and the utilization rate of non-fossil energy are much higher than the national average level. In scenario 3, compared with scenario 2, the recent decarbonization process is relatively slow, which shows that the demand for fossil energy represented by coal is still at a high level, and the carbon emission peaks slightly later than the national average level. In the long term, new energy will enjoy great development and realize carbon neutrality synchronously with the national level.

2.2 Power-industry correlation analysis model and industry screening mechanism

2.2.1 Indicator system

Centering on industrial layout and coordinated development of energy and electric power, combined with policy and industrial planning, the "power-industry" correlation model is established from three dimensions of energy use level, economic contribution degree and industrial planning orientation. The"power-industry" correlation model is analyzed through statistical data with this as the first-level indicator and five second-level indicators. Table 1 shows the indicator Settings.

2.2.2 Model operation mechanism

The model mechanism sets different model running sequences for three scenarios, reflecting the selection of industrial layout and the priority influencing factors considered by different scenarios, as shown in Figure 1.

For scenario 1- Rapid propulsion energy consumption dual control requirements: In this scenario, energy use level is the primary consideration in screening. Therefore, firstly, the energy consumption level of each industry is calculated, certain conditions are set, and the industries that meet the energy consumption level are assigned a fixed reference value (1), while the industries that do not meet the energy consumption level are assigned another fixed reference value (0). Then, the comprehensive value of energy use level, economic

contribution degree and industrial planning orientation of each industry is calculated to obtain the priority ranking of various industries in Scenario 1 in Xinjiang.

Table 1. Indicator setting of power-industry correlation analysis model

First index	Energy use level		economic contribution		industrial planning orientation
Secondary index	Proportion of energy consumption	Proportion of electricity consumption	Contribution rate of total assets	Operating profit as a percentage	Industrial development planning and arrangement
Interpretation of Indicators	represent the energy consumption level of each industry	represent the power consumption level of each industry	Characterize the asset increment efficiency of each industry	represent the value-added ability of each industry	represent the industry into the "fourteen - fifth plan" of the situation

For scenario 2- Steadily promoting the dual-control requirements of energy consumption: In this scenario, it is necessary to comprehensively consider the influence of industrial energy level, economic contribution and industrial planning orientation, score and screen each industry, divide the grades according to the scores, transform and assign scores, and finally get the development priority ranking of each industry in Scenario 3 of Xinjiang.

For scenario 3- Dual control meets the minimum standard requirements: In this scenario, financial contribution is the primary consideration in screening. Therefore, firstly, the economic contribution level of each industry is calculated, and certain conditions are set. The industries that meet the economic contribution level are assigned a fixed reference value (1), and the industries that do not meet the energy consumption level are assigned another fixed reference value (0). Then, the comprehensive value of energy use level, economic contribution degree and industrial planning orientation of each industry is calculated to obtain the priority ranking of various industries in Xinjiang in Scenario 3.

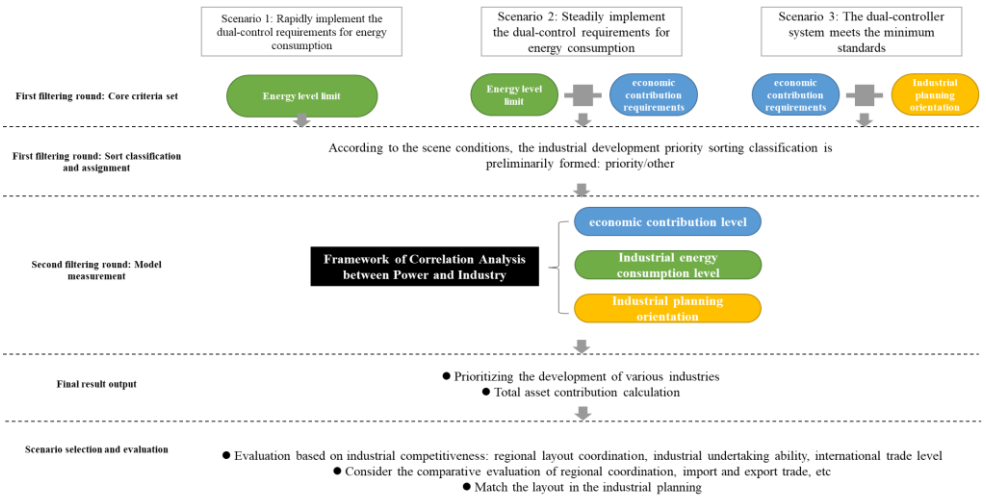

Fig. 1. Model operation mechanism

3. Empirical research: Analysis of Xinjiang's industrial layout and industrial competitiveness

3.1 Research object

Xinjiang, as a large province of energy resources, will play a pivotal role in the process of achieving the goal of carbon peak and realizing the vision of carbon neutralization, constructing a modern energy system, supporting regional development and industrial optimization, and realizing high-quality economic development. On the one hand, Xinjiang itself through the rational planning of economic structure and energy use structure, improve energy utilization efficiency, promote clean rate of local energy supply, promote their own low energy consumption, and make provincial contributions to our country carbon peak carbon and energy. On the other hand, as an important energy output province in our country, the energy structure in Xinjiang will also strongly support our overall utilization of low carbon transformation, and strongly support our country 30, 60 "double carbon" goal to realize.

In recent years, Xinjiang's national economy has shown a trend of rapid development, its comprehensive strength has been significantly enhanced, and a national economic system based on agriculture and led by industry has been established. Xinjiang Autonomous Region has established a national economic system based on agriculture and led by industry. It has initially formed a regional economic pattern with the North Slope of the Tianshan Mountain Economic Belt as the support, railway and highway trunk lines as the framework, and regional and regional economic center cities as the fulcrum, radiating regional economic development.

Therefore, under the current situation, it is urgent to consider how to coordinate and match the industrial layout with industrial energy in Xinjiang, and how to make the best industrial layout and improve the industrial competitiveness under the constraints of the dual-carbon target.

3.2 Basic data

According to the index setting, according to the standardization law of industrial sectors, make a list of industries. Then, relevant data can be obtained from China Statistical Yearbook and regional statistical Yearbook, among which the proportion of energy consumption, the proportion of electricity consumption, the contribution rate of total assets and the proportion of operating profit can be directly obtained. The data of industrial planning orientation is determined according to the list of key industries set in the 14th Five-Year Industrial Plan of Xinjiang. Fixed reference value (1) is given to those conforming to the direction of key industries in the industrial planning, and fixed reference value (0) is set to those not conforming.

The original data are from official reports such as China Statistical Yearbook and Energy Statistical Yearbook. Due to space limitations, the original data are not presented here separately.

Table 2. Model measurement results

Industry	Scenario 1		Scenario 2		Scenario 3	
	Score	Ranking	Score	Ranking	Score	Ranking
Nonferrous metal smelting and calendering industry	1.10	19	1.59	17	1.50	22
Manufacturing of chemical raw materials and chemical products	0.05	38	0.55	38	0.50	39
Petroleum processing, coking and nuclear fuel processing industries	0.21	35	0.40	39	1.19	23
The production and supply of electricity and heat	0.10	36	0.82	37	1.72	21
Non-metallic mineral products industry	0.09	37	0.93	35	0.85	38
Oil and gas extraction	1.06	25	1.91	14	1.85	18
Ferrous metal smelting and calendering industry	0.03	39	0.89	36	0.86	37
Gas production and supply industry	1.03	31	0.97	33	0.94	35
Textile industry	1.02	33	0.99	32	0.97	33
Coal mining and washing	1.10	17	1.08	22	1.98	13
Agricultural and sideline food processing industry	2.05	7	2.03	6	1.98	14
Chemical fiber manufacturing	2.49	1	2.47	1	2.98	3
Ferrous metal mining	1.16	16	1.15	20	1.98	10
Pharmaceutical manufacturing industry	1.05	28	1.02	29	0.98	32
Food manufacturing Industry	2.08	5	2.06	5	1.98	12
Nonferrous metal mining industry	2.09	4	2.03	7	1.93	17
Rubber and plastic products industry	2.03	11	2.00	13	1.97	16
Mining auxiliary activity	1.04	29	1.03	28	0.98	31
Water production and supply industry	1.01	34	1.00	31	0.99	28
Metal products industry	2.02	12	2.01	10	1.99	8
Electrical machinery and equipment manufacturing	2.04	8	2.02	9	1.98	11
Non-metallic mining	1.08	20	1.07	23	0.99	27
Paper and paper products industry	2.04	9	2.03	8	1.99	9
Wood processing and wood, bamboo, rattan, brown, grass products industry	1.07	21	1.06	24	1.00	26
Wine, beverage and refined tea manufacturing	2.11	3	2.11	3	3.00	1
Special equipment manufacturing industry	1.03	30	1.02	30	0.99	29
General Equipment Manufacturing	1.06	24	1.06	25	1.00	25
Manufacturing of communication equipment, computer and other electronic equipment	1.10	18	1.09	21	1.00	24
Textile clothing, shoes, hat manufacturing	1.05	27	1.80	16	1.75	20
Comprehensive utilization of waste resources	2.18	2	2.18	2	2.99	2
Metalwork, machinery and equipment repair industry	1.07	22	1.03	27	0.96	34
Furniture manufacturing industry	1.07	23	1.05	26	0.99	30
Automobile Manufacturing Industry	1.46	15	1.46	19	2.00	4
Printing and recording media reproduction	1.03	32	0.96	34	0.94	36
The tobacco industry	1.50	14	1.50	18	2.00	6
Leather, fur, down and its products	2.04	10	2.01	11	1.98	15
Cultural education, industrial art, sports and entertainment manufacturing	2.01	13	2.01	12	2.00	5
Manufacturing of railway, shipping, aerospace and other transportation equipment	2.07	6	2.06	4	1.99	7
Instrument and meter manufacturing	1.06	26	1.81	15	1.75	19

Table 3. Comparison analysis between "Industrial layout in Industrial planning" and "Optimal layout Results of model analysis"

Key Industries (Standard classification)	South Xinjiang	North Xinjiang	east Xinjiang	Scenario 1	Scenario 2	Scenario 3
Agricultural and sideline products processing industry	*	√*		★	★	★
Textile industry	△	√*		☆	☆	☆
Textile and garment industry	△	√*		☆	★	★
Petroleum, coal and other fuel processing industries (petrochemicals; Modern coal chemical Industry)	√	√	√			☆
Pharmaceutical Manufacturing (Biomedicine)		√*		☆	☆	☆
Chemical fiber manufacturing	√	√		★	★	★
Non-metallic Mineral Products (New building materials)	√	*			☆	
Ferrous metal smelting and calendering industry;		*			☆	
Non-ferrous metal smelting and calendering industry	*	*	√	☆	☆	★
General Equipment Manufacturing		√	√	☆	☆	☆
Special equipment Manufacturing (petroleum and petrochemical equipment manufacturing, snow and ice tourism equipment manufacturing)		√		☆	☆	☆
Electrical Machinery and Equipment Manufacturing (New energy - PV)	√			★	★	★
Computer, Communication and Other Electronic Equipment Manufacturing (Electronic components, mobile phones, computer peripherals)	△*	√		☆	☆	☆
Comprehensive Utilization of Waste Resources (Comprehensive Utilization of Solid Waste)			√	★	★	★
Electricity and heat production and supply industry	√	√	√		☆	★

Note: √ represents local key industries, * represents foreign trade, △ represents undertaking industries in central and eastern China; ★ Indicates the priority of first tier. ☆Indicates the priority of second tier.

3.3 Model calculation results: industrial development layout based on power-industry correlation

Model calculation was carried out according to the model operation mechanism in Part 2.2.2 of this paper, and the calculation results were shown in Table 2. The comprehensive score and ranking of each industry under each scenario are listed respectively. The comprehensive score includes the comprehensive score of industrial energy level, economic contribution degree and industrial planning orientation. The ranking is based on the overall score.

It can be seen that, on the one hand, the industrial layout priorities of the three scenarios are quite different; On the other hand, if the top ten industries are selected as the list of industries with the highest development priority according to the scores of each industry, the three scenarios have a high overlap in the list of the top ten priority industries. This shows that some industries have the characteristics of excellent industrial use and strong

economic contribution under any circumstances, and the overall industrial layout structure is an important factor affecting the scene difference.

3.4 Scenario comparison evaluation: Evaluation based on industrial competitiveness

On the basis of the model calculation, this paper further carries out the evaluation of industrial competitiveness. Combined with relevant evaluation methods, this paper mainly considers three aspects: regional layout coordination, industrial undertaking capacity and international trade level. Among them, the coordination of regional layout reflects whether the industrial layout takes into account the needs of various regions, rather than only leaning on some regions; The capacity to undertake industry reflects whether the development layout of industries in the external provinces has been considered; The level of international trade reflects whether the layout of the industry has taken into account the tilt and consideration of the export industry.

In terms of evaluation methods, it mainly matches the local industry development layout table sorted by industrial planning with the key industries in the 14th Five-Year Industrial Plan of Xinjiang, and makes clear the rationality of the layout of industrial regional layout coordination, industrial undertaking capacity and international trade level.

The overall matching analysis comparison table is as follow (table 3).

As can be seen from the above table, under the three scenarios, there are certain differences and commonalities in the regional layout coordination, industrial undertaking capacity and international trade level of each key industry.

On the one hand, the commonality is manifested in the textile and garment industry, petroleum, coal and other fuel processing industries (petrochemical; Modern coal chemical industry), non-metallic mineral products industry (new building materials), ferrous metal smelting and calendering processing industry, non-ferrous metal smelting and calendering processing industry, electric power, heat production and supply industry and other industries have paid great attention to it. It can be seen that they are an indispensable key industry in Xinjiang's industrial development.

Table 4. Summary and comparison of evaluation results of industrial competitiveness

Scenario	Regional layout coordination	industrial undertaking capacity	international trade level
1: Rapidly	11	3	8
2: Steadily	19	4	13
3: Minimum	28	4	11

On the other hand, the industrial competitiveness evaluation and comparison of the three scenarios (Table 4) Scenario 1, which requires rapid promotion of dual-control energy consumption, is bound to weaken the industrial layout. Compared with other scenarios, it is mainly poor in regional layout coordination. Scenario 3 Dual controls meets the minimum standards and has obvious advantages in regional layout coordination, taking into account the industrial layout needs of southern Xinjiang, eastern Xinjiang and northern Xinjiang.

4 Conclusions and recommendations

In this paper, a power-industry management analysis model is constructed, and a differentiated selection mechanism of industrial layout is realized under three scenarios of dual-carbon target. An empirical study is carried out according to the industrial development layout of Xinjiang, and a scenario comparison evaluation method based on the evaluation of industrial competitiveness is also carried out. Based on the dual carbon target

constraints and actual industrial development, and combined with the industrial selection and medium - and long-term industrial layout needs of Xinjiang, this paper puts forward relevant suggestions as follows:

(1) Coordinate industrial development and power supply and demand in stages according to policy requirements based on dual-carbon target constraints. With the implementation of dual-carbon policies at the provincial and municipal levels, the supply and demand of relevant energy and power and the layout of industrial development will be affected. According to the scenario comparison analysis, in the short term, it is suggested to focus on the development of some key industries according to the scenario results of rapidly promoting dual control of energy consumption, meet the requirements of dual control of energy consumption, and achieve peak carbon neutrality as soon as possible. In the medium and long term, it will gradually coordinate domestic and foreign industrial demand and industrial spatial layout, steadily promote or control energy consumption within a reasonable range of policy requirements, develop local industries and cultivate industrial competitiveness.

(2) Focus on key industries and take into account the layout coordination of southern Xinjiang, eastern Xinjiang and Northern Xinjiang. Scenario analysis and comparison show that it can focus on textile and garment industry, petroleum, coal and other fuel processing industry (petrochemical; Modern coal chemical industry), non-metallic mineral products industry (new building materials), ferrous metal smelting and calendering processing industry, non-ferrous metal smelting and calendering processing industry, power and heat production supply industry and other industries are conducive to the coordination of regional layout.

(3) Dig deep into the electricity-industry correlation, and further promote the coordination between industrial layout and power supply and demand from the practical level. Future research can focus on the practical correlation between the two major sectors of electric power and industry, actively participate in local industrial layout planning, and introduce power supply and demand into the in-depth consideration index of industrial development layout.

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