Preliminary Study on Modern Energy Economy

Shanshan Wu[1,a], Baoguo Shan[1,b] and Weiting Bao[2,c]

[1]Dept.of Economy and Energy Supply&Demand Rsearch, State Grid Energy Research Institute Co.,LTD.,China，Beijing,China

[2]School of Managementdept ,China University of Mining and Technology,China

[a]wushanshan@sgeri.sgcc.com.cn; [b]shanbaoguo@sgeri.sgcc.com.cn; [c]bwt1995@163.com

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Abstract. The purpose of this article is to better grasp the requirements of high quality development of energy economy and deeply learn the "doing well in the modern energy economy" put forward by General Secretary XI. Based on modern energy economy theory, this paper expounds the concept of modern energy economy development from the perspective of characteristics and obstacles, and gives reasonable suggestions for development. These recommendations provide decision-making reference for the government to formulate relevant policies related to high-quality energy development and for enterprises to realize innovation and efficient development. It also provides the theoretical basis and practical basis for the energy industry to promote economic and social development.

Introduction

March 5, 2018, General Secretary Xi Jinping proposed in the deliberation of the Inner Mongolia delegation of the National People's Congress, "to do well in the modern energy economy this article, keep up with the new trend of the world energy technology revolution, extend the industrial chain, and improve the efficiency of comprehensive utilization of energy resources." This important exposition is an important directive for the development of China's energy industry in the new era. It provides a theoretical and operational guide for China's energy economy to move from a high-speed growth stage to a high-quality development stage. At present, the relevant research on the field of energy economy at home and abroad mainly focuses on the relationship between energy economics, energy and economy, as well as the coordinated development of energy-environment and economy. There is very little research on modern energy economy theory, especially about the development of China’s modern energy economy. Therefore, it is important to elucidate the modern energy economy theory and implement the concept of modern energy economy development in the current stage, which is the important proposition of "doing a good job in modern energy economy".

An Overview of Modern Energy Economy Theory

In the 2018 Shanghai Energy Innovation Forum, Zheng Xinye, a professor at the Renmin University of China, proposed that "there is an ' energy impossible triangle ' in the current energy reform, and no single energy source can be supplied with sufficient supply, cheap price, and environment friendly." "The ultimate goal of China's energy reform is to achieve energy supply security, low prices, clean and low carbon, and it is best to optimize the allocation of resources and obtain more social benefits." But at this stage, under the constraints of China's resource endowment conditions, economic development stage and scientific and technological development level, the three goals of energy security supply, low price and clean low carbon are close to Pareto optimal, it is difficult to continue to improve, no matter in which direction the improvement is at the expense of the other direction [1].Because of this "energy impossible triangle", the goal of China's energy reform will not be achieved in a short period of time, so we must first evaluate these goals, and then prioritize these goals to make a choice, so that the current stage of social welfare maximization.

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Modern energy economy theory mainly answers how to break through the scale of economic growth, the energy cost of enterprises and households and the "impossible Triangle" of pollution reduction, and puts forward that in different periods of modern economic development, different degrees of attention should be paid to the three aspects of energy supply guarantee degree, price affordability and clean and low carbon environmental protection degree. In this way， we can better play the role of energy in promoting high-quality economic development and meet the different energy needs in different stages of economic and social development. At the same time, the modern energy economic theory also studies the relationship between modern energy system and modern economic system, clarifies the status and function of the modern energy system in modern economic system and the new requirements of modern economic system in technology, system and business model, and provides a theoretical basis for realizing high quality energy development.

The Development Idea of Modern Energy Economy

"The idea is the forerunner of action, and certain development practices are guided by certain development ideas [2]."Based on the exploration of modern energy economy theory, this paper takes the modern energy economy theory as the ideological origin, closely adheres to China's domestic economic, energy development situation and "two-stage" goal, and further puts forward the "development idea of modern energy economy". The idea as an important guarantee to effectively improve the high quality development of China's modern energy economy, which provides a scientific theoretical program and value orientation for the practice of modern energy economy in China.

The development idea of modern energy economy is the crystallization of the theory and practice of modern energy economy. It’s a scientific summary of the experience and lessons in the process of the construction of China's modern economic system and modern energy system. And it’s also the strategic measure to promote the high quality development of China's energy economy, which greatly enriches the modern energy economy theory. The development idea of modern energy economy requires that the theme of modern energy economy, with high quality of energy development as the main line, based on modern energy system, fully consider the new characteristics of modern economic and social development and new requirements for energy development, and pay more attention to giving full play to the role of energy industry in promoting high-quality economic development, Adhere to the concept of development with equal emphasis on efficiency and fairness, improve the policy system, promote the innovation of the business model of energy economy, and realize the theoretical support effect of modern energy economy on the high quality of energy development.

Characteristics of Modern Energy Economy

To study and implement the concept of modern energy economy, we should first understand the connotation of modern energy economy from the characteristics, and grasp the opportunity of constructing modern energy economic system on the basis of understanding the characteristics. The concept of modern energy economic development is an essential theoretical and practical basis for the construction of modern energy economic system, and also a prerequisite for realizing the goal of "the second century". The modern energy economy has the following five characteristics.

1. Strong Supply Security Is the Basic Characteristic of Modern Energy Economy

Energy is the key to support the development of the country. Securing energy supply is the most basic and primary task of the energy industry. Whether the historical energy shortage led to the stagnation of production, or at present, with the progress of energy technology to make the supply relatively abundant stage, or the future of unlimited energy supply, the protection of energy supply will always be the essential requirements of economic and social development for the energy industry.

With the improvement of people's living standards, the energy industry has begun to have the problem of "structural and effective supply shortage". On the one hand, with the slowdown in

economic growth, the fundamental driving force for energy consumption growth has changed. The growth of traditional high-energy-consuming industries such as steel, building materials, nonferrous metals and chemicals has slowed down, and energy consumption has entered a peak platform period. As shown in the Fig.1. Coupled with the tightening of environmental constraints, China's fossil energy market is in the period of weakening demand intensity, excess capacity digestion period, environmental constraints and strengthening period of the three period superposition stage. And clean energy is more facing the problem of technology and economy.

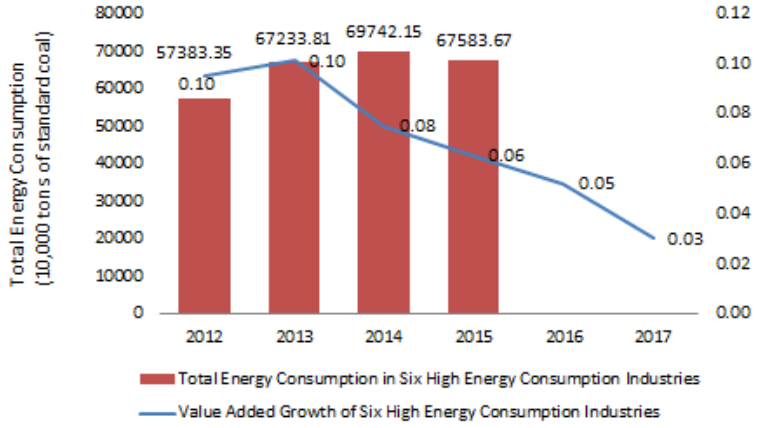

Figure 1. Total energy consumption in the six major energy-consuming industries in 2012-2017

On the other hand, with the development of society, the energy consumption content, consumption level, consumption structure, consumption mode, consumption preference and so on will change in all walks of life. In general, transportation energy, service industry and residential life energy have gradually become the main driving force for energy demand growth. Consumers' demand for higher quality energy products and services is expanding, and access to greener and lower carbon energy sources is obtained. Expectations for more convenient and intelligent energy services are on the rise.

In general, ensure energy supply is no longer simply to meet the demand for electricity, but to increase the supply of high-quality energy and provide multi-directional energy services.

In the modern energy economy, the core connotation of high-quality energy development is to create a clean, low-carbon, cost-effective, safe and reliable energy supply system. High-quality energy supply requirements have always been people-centered to meet the people's good life demand. High-quality energy is cleaner, low carbon, energy supply more safe and reliable, so that people can share the dividends of high-quality energy development.

2. Affordable Price Is an Important Feature of Modern Energy Economy

Energy price is the soul and signal of the market economy. The market competition centered on energy price directly determines the effectiveness of energy consumption, energy supply and energy technology revolution. With the increasing level of globalization and marketization in China, excessive government intervention in energy prices will weaken the adjustment effect of energy prices on energy demand, resulting in distortion, failure and inversion of energy prices, and increased risk of private capital entering the energy industry, ultimately leading to structural imbalance in the energy sector. At the same time, the solidified price system also limits the expansion of the variety of energy products, hindering the process of upgrading energy consumption.

Modern energy economy is to form a reasonable and transparent market-oriented energy price mechanism, supplemented by fair and effective energy subsidy design and strict cost supervision, so that prices fully reflect the relationship of market supply and demand.

(1) Reflecting the market supply and demand relationship, reflecting the degree of energy scarcity, and accelerating the internalization of environmental external costs. At present, China's energy prices only reflect the cost of energy development. They do not reflect the scarcity and

externalities of energy resources. So they lack of restraint on the main body of energy consumption, resulting in excessive energy demand. For producers and consumers, easing energy price controls can make China's energy prices sensitively reflect market supply and demand. It makes enterprises and individuals to become aware of the scarcity of energy resources. It promotes enterprises to pay more attention to efficiency and improve the current waste of resources. Easing energy price controls can fully play the price of information release and leverage, and enhance the awareness of energy conservation in enterprises and individuals. From the Government's point of view, the government has transitioned from an energy industry administrator to a regulator of the energy market in the process of price marketization. It is necessary to keep the industry in a sustainable development situation and let the price reflect the actual cost. We should promote the formation of a unified national market, correct market failures and implement fair and effective policies, such as economic incentives, price subsidy policies, and market mechanism policies and encourage diversified energy investment.

(2) Differential pricing mechanism. In the modern energy economy, different types of energy products are priced separately. For the renewable energy and clean energy sources such as wind energy and solar energy encouraged by the state, the incentive price will be set, and for the energy-intensive and high-pollution energy, the price will be imposed. In addition, pricing is based on different types of consumer subjects. High-energy, high-pollution companies will pay more than green ones. Carry out price reforms to diversify domestic energy resources. Implement technological innovation and advanced management to adjust energy structure and improve energy efficiency. Therefore, we should build a clean, low-carbon, intelligent and efficient energy supply and demand system to realize the linkage of various energy prices such as coal, electricity, oil, gas and new energy power generation.

3. Clean Low Carbon Environmental Protection Is the Core Feature of Modern Energy Economy

Modern energy economy requires the transformation of global energy to green and low carbon. On the production side, China implements clean substitution, replaces fossil energy with clean energy such as solar energy, wind energy and water energy. On the one hand, we optimize the development of non-fossil energy. On the other hand, we develop hydropower in an orderly manner, develop nuclear power safely and efficiently, optimize the layout of wind energy and solar energy, and develop biomass and geothermal energy according to local conditions. On the consumption side, electric energy substitution is implemented, including electricity to replace coal, electricity to replace oil, electricity to replace gas.

In recent years, under the vigorous promotion of various energy transformation and reform policies, China's energy consumption has shown a steady growth trend. The conditions and levels of energy use have been continuously improved. The energy consumption structure has been continuously optimized, the proportion of clean consumption has continued to increase, and the proportion of coal consumption has continued to decline. In 2017, the country's total energy consumption was 4.49 billion tons of standard coal, an increase of 2.2 percentage points year-on-year, supporting the medium and high-speed development of the economy with lower energy consumption. Coal accounted for 60.4%, a cumulative decline of 8.1 percentage points in five years; the proportion of clean energy increased significantly, natural gas and non-fossil energy consumption accounted for 20.8%, an increase of 6.3 percentage points in five years, the largest increase in history in five years.

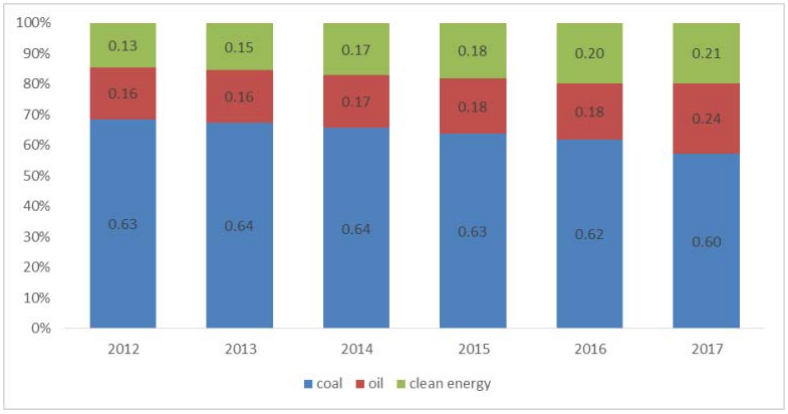

Figure 2. Share of energy consumption, 2012-2017

In terms of clean and efficient use of coal, China has strengthened the whole life cycle of coal from the fields of coal product quality, coal-fired power generation, coal chemical industry, coal-fired boilers, coal grading and mass utilization, civil dry coal treatment, and waste resource utilization. The industrial chain will promote the clean utilization of coal and continue to promote the transformation of coal production and utilization methods.

In terms of clean coal power management, China has become the world's largest clean coal utilization country, and renewable energy has entered a stage of large-scale development. In 2017, the installed capacity of renewable energy power generation in China reached about 656 million kilowatts. The newly installed capacity accounted for about 40% of the global increase, and the construction cost of wind power and photovoltaic power generation decreased by 20% and 60% respectively. The national non-fossil energy power generation capacity reached 38.7%, an increase of 10.1 percentage points in five years, and the installed capacity of clean energy power generation such as water, nuclear, wind and light was about 700 million kilowatts, and the newly installed capacity accounted for more than 40% of the global increase. The installed capacity of hydropower, wind power and solar power rank first in the world.

In terms of cleaning low-carbon and environmentally-friendly energy consumption models, China still has many shortcomings. There is room for improvement. It can learn from international advanced experience to achieve clean, low-carbon and environmentally-friendly energy consumption. In the modern energy economic system, optimizing energy layout, controlling coal consumption, improving energy efficiency, and encouraging new energy research and development are the main policy directions. The improvement of the renewable energy policy system, especially the improvement of renewable energy subsidies and tax policies, and the soundness of the energy industry system are the guarantees for promoting clean energy and green development.

4. Efficient Allocation of Resources Is the Essential Characteristic of Modern Energy Economy

China's energy resources and energy demand are reversely distributed. The energy demand in the eastern region is relatively large, but the energy resources are relatively poor. The energy demand in the central and western regions is small, but the energy resources are abundant. Under the basic national conditions of China's reverse distribution of energy resources and demand, it is necessary to achieve coordinated energy concentration and decentralization, coordination of large-scale resource allocation and distributed proximity. It’s also critical to achieve clean, safe, efficient and convenient energy services for all to meet their multi-level, multi-agent, diversified energy needs. At present, China's energy optimization and allocation capabilities are relatively insufficient.

In the modern energy economic system, the energy industry can eliminate institutional barriers, liberate productivity, allow all entities to enter and increase supply equally through market-oriented reforms. At the same time, the energy industry can achieve structural transformation through competition to reduce costs and improve resource allocation efficiency. The market-oriented reform of the energy industry includes the reform of the supply and demand mechanism, the competition mechanism and the risk mechanism, and must be supported by a price mechanism. The first is the supply and demand mechanism. A basic balance between supply and demand is achieved by

regulating social production and demand. For example, the fundamental of the reform of the power supply and demand mechanism is to achieve the overall optimality of the power system from production to transportation to utilization on the basis of efficiency and fairness. Secondly, the competition mechanism encourages all types of investment entities to enter the open competition in the field of energy development, accelerate the market-oriented reforms in the fields of electricity, oil and natural gas, and break the monopoly of all the above-mentioned fields and links as much as possible. Again, it is a risk mechanism. For example, the power industry should establish a systematic and systematic prevention mechanism, which not only must effectively prevent the risk of safety accidents, but also prevent environmental risks, investment and financing risks, and so on. At the same time, the reform of energy marketization should be supported by price mechanism reform. Energy price is the soul and signal of market economy. Market competition centered on energy price directly determines the effectiveness of energy consumption, energy supply and energy technology revolution. Energy price reforms help private capital enter the energy industry and contribute to mixed ownership reform.

The energy sector also needs the government’s help, because the energy industry has the characteristics of public welfare. It is a basic industry that affects the national economy and the people's livelihood. Therefore, in the short term, it cannot be completely marketed. The government still plays a certain role, such as the environmental problems, the fairness of energy use, and so on. At the same time, the energy industry is also a relatively concentrated state-owned enterprise. State-owned component will inevitably lead to the monopoly of the energy industry.

In the modern energy economy, it is necessary to take into account factors such as resource endowment, economic development, energy demand, and price affordability in various regions. It requires rational development of coal-fired power, and at the same time strengthens cross-provincial inter-regional interconnection and mutual aid complementary channels to achieve clean energy. The modern energy economy requires the use of large-scale, long-distance transportation and large-scale optimal allocation to build a scientific and rational energy comprehensive transportation system, including the construction of an ultra-high-voltage effective smart grid. The power grid has become a green platform for optimizing the allocation of energy resources, eliminating clean energy and providing sustainable, reliable and efficient energy security for economic and social development.

5. High Economic and Social Benefits Are the Prominent Feature of Modern Energy Economy

Economic and social benefits are interdependent and dialectical. On the one hand, economic benefits can promote the formation of good social benefits in the energy industry. The profitability encourages energy companies to use surplus funds to improve production technology, reduce enterprise costs, and increase investment in innovation, thereby producing more energy products that meet higher consumer demand and forming good social benefits. On the other hand, the accumulation of long-term social benefits can bring greater economic benefits.

China's energy industry is particular. Currently, because of the high proportion of state-owned enterprises, energy industry pays more attention to social benefits. But the modern energy economy can realize both economic and social benefits.

The energy industry drives rapid economic growth. In the modern energy economy, the popularity of energy internet is an inevitable development trend. The core of the energy Internet is "smart Grid + UHV grid + clean energy". The social benefits of smart grid mainly include the reliability benefit of power supply, the benefit of many new energy grids, the benefit of energy saving and emission reduction, the incentive of users to save energy and the benefit of investment, and its economic benefits mainly include saving effective installed capacity of power generation link and reducing the cost of total power generation fuel, The power grid link saves the power grid construction investment and reduces the power network loss cost, the user link saves the user's electricity bill expense and reduces the user blackout loss expense. The ecological and economic benefits of clean energy are also immeasurable. The clean energy industry is more labor-intensive and can create more job opportunities. The production of electricity per unit creates more jobs than the fossil fuel industry.

The energy industry drives regional balanced development. The modern energy economy can realize the large-scale development, transportation and use of clean energy in the world by constructing the global energy Internet, that is, the modern energy system with clean dominance, electricity as the center, Interconnection and co-construction and sharing.

The energy industry promotes innovation in technology and business models [3].In the modern energy economy, around the "Internet + Energy" has produced a variety of business model innovation, including intelligent energy control, operational intelligent decision-making, energy management platform, multi-energy trading platform and so on. In addition, "Internet + energy" also produces network, platform-type and other industrial organization models. It promotes the network economy, economies of scale, digital economy, sharing economy, crowd funding financing, derivative and value-added product services and other Internet economic models in the field of energy applications. At the same time, it is also reshapes the energy system business model, brings new economic growth points and achieve more economic benefits.

Obstacles to the Implementation of the Concept of Modern Energy Economy Development

1. Idea Obstacle

Lack of comprehensive understanding of energy attributes. For a long time, because energy is related to the economy and economy, with natural monopoly, relatively independent technology and other objective characteristics, energy industry development and economic activities have been relatively closed. Strategic and public substitution of commodity, become the main attribute of energy. On the one hand, the government has firmly controlled the approval of energy projects, shipping and the formulation of energy product prices, on the other hand, state-owned capital has mastered absolute control over the energy industry, thus further strengthening the public product attributes of China's energy, and commodity attributes have been weakened. Taking the electric power industry as an example, although China has carried out the reform of electric power marketization in recent years, the power products have always been the means and tools of the government's macro-control, the government holds the investment decision right of major power projects and the pricing right of the price of electric power products, and its commodity attributes are still not completely restored. In addition to commodity attributes, energy products should also have financial attributes. However, at present, China's domestic research on energy finance is still in its infancy, the types of energy and financial products are relatively single, energy futures, energy options, energy swaps and other energy financial derivatives category is less, the degree of financing openness is low, the derivatives market is lagging behind and the volume of transactions is small.

The energy industry's understanding of its strategic position is not deep enough. All along, energy has appeared in the economic and social system as a basic industry, supporting the economic growth. Generally speaking, the energy industry belongs to the heavy asset industry, the investment scale is large, the construction cycle is long, in order to guarantee the steady economic and social development, the development of the energy system should be ahead of the development of the economic system. However, due to the lack of deep understanding of the industry's own strategic position, the development of China's energy industry is often passively adapted to the needs of economic development. In the stage of rapid economic take-off in China, the energy industry tends to lag behind the speed of economic and social development. Limited by the inertia of traditional perception and the transformation of the role of the energy industry, the energy industry has not been able to have a deep understanding of its own role changes.

Pay insufficient attention to economic issues such as quality and efficiency. China's energy development to ensure supply as the starting point, pay attention to the scale effect of energy supply, energy quality and industry benefits of the attention is obviously low. At the top level of decision-making, taking the energy "Thirteen-Five" plan as an example, there are few expositions on the economy in the text, and in the 25,000-word plan, only 29 refer to the "economy", and most of them focus on the macroscopic background and necessity, and the discussion that really focuses on economy is only slightly involved in the policy orientation. At the same time, the document simply

equates "economic benefits" with "low-priced energy", ignoring the positive role of expanding the "gross value of production" through high-quality development. In scientific research, according to CNKI statistics, so far, 184,307 of the literature with "energy" as the key words, only 179 of the keywords include "economy", the proportion of less than 1. Even the proportion of research with the broader concept of "economy" as the key word is less than 5%.

2. Mechanism Impediment

Interest distribution is not reasonable enough. The unreasonable distribution of interests in the process of energy development and the imperfect distribution mechanism of energy input and output will hinder the transformation of energy advantages into economic advantages and hinder the development of modern energy economic concepts. In China's current energy resource benefit distribution mechanism, the interests of local governments and residents in resource locations are often ignored [4].Generally, local governments receive less benefit sharing from resource compensation fees and it is difficult to obtain compensation from resource development through taxation. The interests of local residents are also difficult to guarantee only through subsidies from the central government. The imbalance of interest distribution has made it difficult to implement and implement central policies in the local area [5].At the same time, the unreasonable distribution mechanism of benefits will also lead to increased conflicts between residents, local enterprises and local governments, hinder the smooth development of resources, and even lead to public crises. In addition, the unreasonable distribution of benefits in the input and output of energy is likely to lead to high barriers between provinces and affect the effective allocation of energy. China's energy resources and consumption demand are reversely distributed. The eastern energy demand is relatively large but the resources are relatively scarce. The central and western energy demand is small but the resources are relatively abundant. This objective fact determines that China must build a large energy market and optimize resource allocation on a larger scale. However, the distribution of interests between the central and regional, regional and regional areas is unreasonable. The performance appraisal of each region is directly linked to energy consumption. Local governments have serious protectionism against resources such as thermal power in the province, and the power loss from peak shaving is not available. Reasonable compensation, these all affect energy dispatching.

Industrial integration mechanism is not in place. At present, different energy varieties in China have formed a separate energy industry, it is difficult to integrate and collaborate among suppliers, and the government management departments have concentrated energy pricing rights, resource allocation rights and project approval rights according to energy varieties, further limiting the unity, order, openness and competitiveness of various energy variety markets, Has formed barriers to the entry of small and medium-sized enterprises. On the one hand, China’s traditional energy system is divided into different energy types, which is composed of several relatively independent subsystems. They have their own development ideas, planning and operation mechanisms. There are institutional barriers between each other, resulting in weak mutual conversion capacity and low efficiency of comprehensive energy utilization. Energy quality development process is hindered. Such an energy supply model is difficult to support the transformation of consumption patterns and the development of business innovation. On the other hand, due to the lack of a good integration mechanism between China's energy industry and other industries, the formation of an independent operation pattern, various types of energy information are relatively closed and poorly shared, and the phenomenon of “information islands” is obvious, which ultimately leads to a short industrial chain in China's energy industry.

Innovation incentive mechanism is not perfect. The lack of perfection of China's innovation incentive mechanism hinders the development process of energy product differentiation and diversification, resulting in less selectivity for China's energy products [6].The lack of innovative incentives has led to companies not being able to innovate in energy products, services and business models. This has further led to a single type of energy products in China, a solid business model, and unable to adapt to the current diversified, high-quality energy needs.

Regulatory mechanisms enforcement is not enough. The current regulatory mechanism in China mainly has the following problems: First, the distribution of regulatory responsibilities is not clear [7].At present, China's energy industry supervision and management duties are relatively scattered. There are many problems between the relevant departments. The coordination of work is more difficult. Second, the supervision efficiency is low and the effectiveness is weak. Supervision work lacks the necessary legal and regulatory support, which affects the effectiveness of supervision to a certain extent. The Energy Regulations, which are an important legal support for supervision work, have not yet been released. Third, the main body of supervision and supervision are single. It is difficult to meet the needs of the reform of "distribution service". In addition, the government has a single means of supervision, mainly relying on compulsory means, so that the power of supervision cannot be distributed among multiple entities. The functions of other social groups outside the government have not been effectively released.

3. Objective Obstacles

The stage of development is insurmountable. The development idea of modern energy economy can't be divorced from the basic national conditions of China's energy economy system. Although China's energy industry has made remarkable achievements, China's basic national conditions, which China is still in and will be in the primary stage of socialism for a long time have not changed. The basic judgment that China's energy still has a lot of room for development has not changed. At present, China is in the period of rapid development of industrialization, urbanization and automation. Urban concentration and dispersion effects are simultaneously manifested. The development of energy consumption patterns of traditional high-energy-consuming industries has entered a platform period. The development of high-value-added medium and high-end industries is lack of technological innovation support. These are the inevitable obstacles that China faces at the current stage of development.

Resource endowments are immutable. China's energy resources are characterized by "rich coal, less oil and gas shortage", and coal will remain China's main energy source for a long time. Compared with oil, natural gas and other energy sources, coal has relatively low calorific value and relatively high pollution, which reduces overall energy efficiency. Compared with developed countries, China's energy consumption structure level lags far behind the world average.

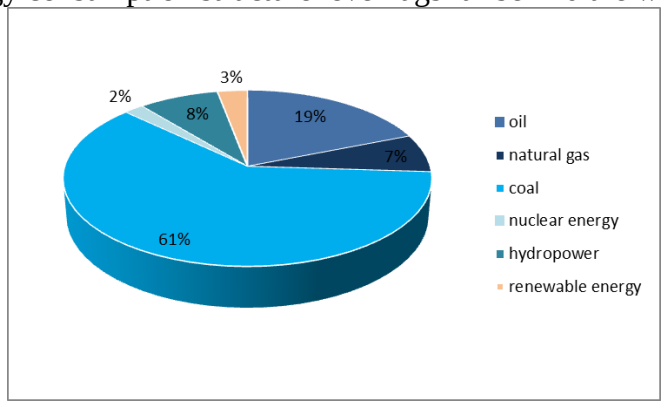

Figure 3. The structure of primary energy consumption in China in the 2017

China's energy resources and load centers are inversely distributed, and the energy consumption in the eastern coastal areas is relatively high [8].China's energy distribution is in an uneven pattern of "more north and less south, less west and more east". Coal, wind and solar resources are concentrated in the northwest, hydropower resources are concentrated in the southwest, and oil and natural gas resources are mainly in the east, middle and west. Large-scale energy bases are mainly concentrated in the western regions with better energy endowments, but the economic development level in the western regions is relatively backward, energy demand is not high, and it is far from the economically developed central and eastern load centers. The existence of resources is in contradiction with the geographical area of energy consumption. This has formed the current energy

flow pattern of large-scale, long-distance North Coal South Transportation, North Oil South Transportation, West-East Gas Transmission, and West-East Power Transmission.

Technical bottleneck is difficult to break through. Currently, there is still a big gap between China and the world's powerful countries in energy science and technology innovation. The main performance are: (1)Lacking of core technology, and key equipment and materials rely on import. Technologies such as solar thermal power generation, hydrogen production and hydrogen fuel cells, wind power, energy Internet, energy storage, cogeneration of cooling and heating, energy conservation, and demand side management have not yet broken through.(2)The third-generation nuclear power, new energy, shale gas and other key technologies have long been introduced and digested and absorbed [9]. The cost of mining and utilization of emerging energy is still high, and it is difficult to commercialize.(3)Gas turbines and high-temperature materials, marine oil and gas exploration and development technology and equipment, etc. have long been behind.(4)New energy generation is difficult to connect to the grid.

Conclusion and Recommendation

In the process of implementing the concept of modern energy and economic development, there are some obstacles. Some of these obstacles are objective and unavoidable, while others can be overcome. In order to better overcome these obstacles and implement the modern energy and economic development idea, we should comprehensively deepen market reforms, build an effective competitive market system, give full play to the market's regulatory role, and make the market play a decisive role in the optimal allocation of energy resources. Vigorously promote the construction of interconnected infrastructure, strengthen international energy exchanges and cooperation, and keep up with the new trend of the world's energy technology revolution. At the same time, strengthen energy technology innovation and further enhance the level of energy innovation development. Accelerate the clean and efficient use of traditional energy sources, promote the rapid development of clean energy, energy storage and other industries, promote the transformation of energy consumption, develop new forms of energy industry, and form new economic growth points[10].

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