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Research on the Development Trend of Renewable Energy in Low Carbon Environment

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Abstract: With the accelerated transformation of the world's energy into green, low-carbon and clean, renewable energy has gradually become the core of global energy transformation, accelerating the pace of development of "low-carbon" renewable energy systems in the world. Based on the analysis of the development characteristics, influencing factors and future development trends of renewable energy systems, it is considered that China's renewable energy development potential is huge, and the investment in renewable energy should be increased on the basis of further optimization and adjustment of energy structure.

Keywords Low carbon, Renewable energy, Development trend

INTRODUCTION

After the 2015 Paris Climate Change Conference, the transition to clean energy has gradually become the mainstream of energy development in the world. Renewable energy is increasingly becoming an emerging energy source in the world [Liu, et. Al., 2014]. Especially since the beginning of the 21st century, the world's regions and countries have paid more and more attention to sustainable development issues such as energy security, climate change and ecological environment. It has become a common consensus to accelerate the development of renewable and efficient utilization [Xun, et. al., 2010]. At present, the global energy development enters a new stage, and the energy transformation process characterized by high efficiency, cleanliness and diversification is accelerating, and the global energy supply and demand pattern is also undergoing profound adjustment [Ma, et. al., 2014]. At the end of 2016, the United Nations Climate Conference in Morocco, more than 100 countries announced the addition of the Paris Agreement, commitment to achieve sustainable development through carbon emissions and decarbonization initiatives in the energy sector, of which 47 are most vulnerable to climate change [Yu, et. al., 2116]. The affected countries propose to fully realize the goal of renewable energy, and promise to fully realize the supply of renewable energy in 2035-2050, which can help achieve the goal of achieving temperature control globally [Liu, 2011]. Up to now, almost all developed and developing countries have put forward policies to vigorously develop renewable energy.

Under the background of low-carbon environment, countries around the world are increasingly promoting the promotion of clean low-carbon renewable energy, paying more and more attention to the development of green, low-carbon and clean environment, and increasingly placing renewable energy plans in Paris. Under the framework of the Agreement, cooperation in the field of international clean energy is launched.

CHARACTERISTICS OF THE WORLD'S RENEWABLE ENERGY DEVELOPMENT

In recent years, renewable energy has been contributing more and more to the field of power generation. As far as its development situation is concerned, it mainly presents three development characteristics, which can be seen in Figure 1.

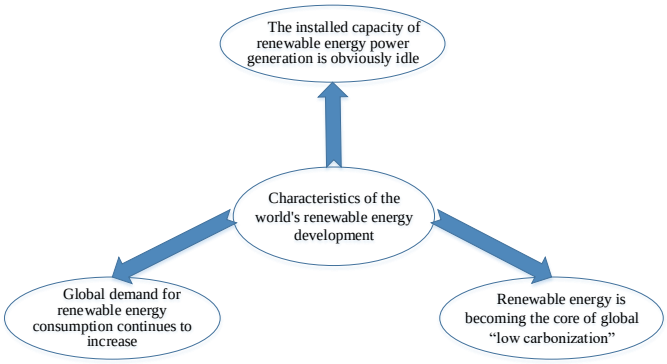

Figure 1 The characteristics of the world's renewable energy development

The installed capacity of renewable energy power generation is obviously idle

In recent years, the global installed capacity of power generation in the renewable energy market has grown significantly. In 2016, the global installed capacity of renewable energy generation was 161 million kilowatts, accounting for 62% of all new power generation installed capacity. The cumulative installed capacity reached 2.02 billion kilowatts, an increase of 9% compared with 2015, breaking the installed capacity of renewable energy. new record. At the same time, the installed capacity of renewable energy power generation exceeded the fossil energy power generation capacity for two consecutive years. It can also be seen that renewable energy power generation has increasingly become an important force that cannot be ignored in global power generation. It also shows that the transformation of power system structure is being realized.

Global demand for renewable energy consumption continues to increase

Currently, North America, Europe and Asia and Asia are major regions for renewable energy consumption. BP's data shows that in 2016, renewable energy accounted for 23.1%, 34.3% and 34.4% of total global consumption in North America, Europe and Asia, respectively. Renewable energy consumption in these three regions accounted for nearly 92%. The renewable energy consumption of major countries in the world is as follows: First, the proportion of renewable energy consumption has increased steadily. With the energy transformation and the increasing support for renewable energy in the world, the proportion of renewable energy consumption in countries will continue to increase. The US Energy Information Administration forecasts the world's renewable energy consumption. By 2050, China's renewable energy consumption will account for 38.7%, the United States 16.2%, and India 12.4%. Second, the growth rate of renewable energy consumption in emerging economies exceeds that of developed countries, and emerging economies are increasingly becoming the main market for renewable energy consumption. The four emerging economies of China, India, Brazil and Russia account for nearly 70% of renewable energy consumption in 2050, making them the most important renewable energy consumer market.

Renewable energy is becoming the core of global “low carbonization”

Since the beginning of the 21st century, with the increasing emphasis on world economic growth and the international community's sustainable development issues such as energy security, ecological environment and climate change, accelerating the development of renewable energy utilization and improving energy efficiency has become the universal consensus of all countries in the world. . At present, the global energy development enters a new stage, and the energy transformation process characterized by high efficiency, cleanliness and diversification is accelerating, and the global energy supply and demand pattern is also undergoing profound adjustment. At the end of 2016, the United Nations Climate Conference in Morocco, more than 100 countries announced the addition of the Paris Agreement, commitment to achieve sustainable development through carbon emissions and decarbonization initiatives in the energy sector, of which 47 are most vulnerable to climate change. The affected countries propose to fully realize the goal of renewable energy, and promise to fully realize the supply of renewable energy in 20330-2050, which can help achieve the goal of achieving temperature control globally. Forecasts show that clean energy accounts for a total of 54% in 2050, of which 72% of the increase in power generation will come from non-fossil energy generation. Although many countries have rich fossil energy and sufficient reserves, such as Canada, Australia, the Middle East and North Africa, they still attach great importance to the development of renewable energy and put it into practice. By the end of 2016, 176 countries have set renewable energy development targets and made reasonable plans for key support areas.

FACTORS AFFECTING THE DEVELOPMENT OF RENEWABLE ENERGY

Active transformation of global energy policy

In order to accelerate the process of energy transformation and renewable energy development, the EU and EU countries have formulated a series of policy objectives. Since 2007, the EU has begun to integrate energy and climate change policies. In 2010, 2011 and 2014, the European Union introduced the “Energy 2020 Strategy”, “Energy 2050 Roadmap” and “Energy and Climate 2030 Strategy”. In 2015, the European Commission issued the “Energy Alliance Strategy Document” with the main purpose. It is to establish a safe and stable energy development path, and to create a unified natural gas procurement organization for Europe, hoping to reduce the overall external energy dependence of the EU. With the transformation of the world's energy to clean, the progress of renewable energy development has been put forward. The important agenda of emerging economies such as China, India, Brazil, South Africa, etc. The International Energy Agency predicts that in the next 25 years of development, the growth of energy demand will mainly come from emerging economies and developing countries, which also means emerging The economy and developing countries will become the main force for the future development of renewable energy.

The cost of power generation is declining

According to the International Renewable Energy Agency, in the next two years, the cost of renewable energy, including biomass and hydropower, will be almost the same as the cost of fossil fuel power generation, and the decline in power generation costs is also important for the world's energy development. signal. Research shows that between 2010 and 2017, the energy sharing cost of renewable energy generation such as conventional solar photovoltaic power generation, onshore wind power generation, focused solar power generation and offshore wind power generation has shown a significant downward trend. In terms of conventional solar photovoltaic power generation, the cost of power generation is the most obvious. During 2010-2017, its cost dropped from 0.36 US dollars per kWh to 0.10 US dollars per kWh, a drop of 73%. During the period of 2010-2017, the cost of focused solar thermal power generation dropped from 0.33 US dollars per kWh to 0.22 US dollars per kWh, and the decline rate also reached 34%. It can be seen that with the continuous improvement of technology and innovation capabilities, the cost of renewable energy power generation has already competed with the cost of fossil fuel power generation and is even more competitive. At the same time, the International Renewable Energy Agency reported that if the bid price is lowered, the global solar PV average power generation price will be reduced to 0.06 US dollars per kWh in the next two years, while the offshore wind power price can be reduced to 0.05 US dollars kWh. Compared with fossil fuels, the reduction of power generation costs and the increasing energy efficiency are important driving forces for the continuous development of renewable energy.

The focus of energy investment shifts to green and clean energy

The climate change and the signing of the Paris Agreement have accelerated the global energy transformation process, making the long-term prospects of renewable energy more certain, reducing investment risks, and investing more than 200 billion US dollars for seven consecutive years. According to Bloomberg New Energy Finance and Economics data, in 2016, while global renewable energy power generation capacity recorded another record, new investment fell to US$241.6 billion, down 23% year-on-year. The reasons are mainly due to three reasons: the cost of photovoltaic power generation and wind power generation has dropped significantly; the investment trend in Europe and the United States and emerging economies has slowed down; the popularity of applications has increased.

Further optimization and adjustment of industrial structure and energy structure

International experience shows that there is a certain degree of mutual influence between industrial layout and changes in energy consumption structure. Generally speaking, in the industrial structure, industry and manufacturing have the greatest impact on the energy consumption structure. If a country adopts industry or manufacturing as the leading development system, then its consumption of fossil fuels such as coal, oil and natural gas is relatively high. If a country is dominated by services, it is more sensitive to electricity demand. With the economic development, technological progress, optimization and adjustment of new industrial structure and the promotion of renewable energy, the industrial structure and energy consumption structure will be adjusted to a certain extent. The optimal allocation of industrial structure and energy structure elements will play a certain role in promoting the development of renewable energy in the future.

Artificial intelligence accelerates the development of renewable energy

With the new era of science and technology revolution, artificial intelligence technology has become an inevitable choice for the development of power grids, and it is also an important strategic support for the transformation and development of energy and power. In the context of the evolution of the power grid to the energy Internet and the wide-area interconnection of high-voltage large-scale power grids, the integration of artificial intelligence and grid application technology will effectively improve the ability to control complex power grids, improve the security of power grid operations, and transform the service model. Finally, the “AlphaGo” for energy and power systems and the automatic driving of energy and power systems are the ultimate goals of artificial intelligence in the field of energy and power. Active promotion of renewable energy in countries around the world. American focused solar thermal power generation has become an important element in responding to the demand of the US power grid, and the continuous advancement of solar thermal power generation technology and deep innovation is the key to ensuring low-cost energy consumption for consumers.

FUTURE DEVELOPMENT TREND AND ENLIGHTENMENT OF RENEWABLE ENERGY

Future development trend of renewable energy

First, renewable energy is the main direction of future global energy transformation. There are three main directions for the world's energy reform, namely, optimizing energy layout and promoting sustainable development of renewable energy; vigorously promoting the consumption and production of green and low-carbon natural gas; cultivating and growing up with multi-energy complementary system integration optimization, Internet + smart energy engineering as the representative New format. Although renewable

energy still does not have a significant impact on the entire energy industry, in the power sector, renewable energy has begun to have a profound disruptive impact on the existing economic and energy system order. The EIA report predicts that renewable energy will continue to grow over the next five years, with its main areas focusing on solar and wind power and a substantial complement to hydropower. At the same time, by 2022, the continued growth of renewable energy will likely hit 30% of the global electricity market, and the total installed capacity of power generation will increase to 920GW, a growth rate of more than 40%.

Second, the cost of renewable energy technologies will be greatly reduced, and the proportion of energy systems will increase significantly. The World Energy Council estimates that wind and solar energy will continue to grow in the future. The improvement of renewable energy technology, especially wind and solar energy utilization technologies and power generation efficiency, is expected to reduce the cost of renewable energy generation by 70% by 2060. By 2060, solar power will account for 20%- 39% of total power generation, and wind power and photovoltaic power generation will account for at least 20%. In this context, large-scale energy storage technology will be widely used to meet the volatility of distributed energy development.

Third, the future development of renewable energy needs international cooperation, sustained economic growth and continuous technological innovation. The transition to green, low-carbon, and clean energy is an extremely important goal for all countries in the world to develop to the present stage. However, in the process of realizing energy transformation and vigorously developing renewable energy development, countries and regions around the world will face a series of problems, such as the turbulence of the international political and economic situation, the fluctuation of US shale gas production, and the economy of emerging economies. The development of energy and the increase in energy consumption and the challenges in the development of renewable energy, etc., these contradictions or problems can not be fundamentally resolved by a single country or a single region. To achieve international cooperation in renewable energy, on the one hand, it can break through the bottleneck of investment or financing decline. On the other hand, through international technical cooperation, technological innovation and optimal allocation of resource elements can be realized, which can further optimize the original energy structure and achieve Sustainable development of renewable energy.

Enlightenment to China

First, the foundation for energy transformation is still relatively weak. Compared with developed countries such as Europe and the United States, China's manufacturing industry is still the main driving force for the development of the country's economy. Along with the slowdown of China's economic growth, the economic structure and industrial structure have been continuously optimized and upgraded. While the service industry has developed rapidly, it has also laid a good foundation for China's transition to low-carbon clean energy. In contrast, the service industry in developed countries accounts for about 80% of the country's economic development. The service development-led economic development model not only provides an important guarantee for energy transformation and the development of more renewable energy.

Second, renewable energy is highly dependent on policy. From the current development of renewable energy in China, China's renewable energy still has some problems compared with traditional fossil energy, such as wind power, solar energy and other power generation costs are relatively high; the power subsidy intensity is higher; the subsidy funding gap is larger ; low competitiveness. The development of renewable energy as a whole has a high dependence on China's policy support, and is greatly affected by policy adjustments. The sustainable development of its industry is more restricted. In addition, the national carbon emission market has not yet been established. The current energy price and taxation system cannot reflect the ecological environment costs of various types of energy, and there is no fair market competition environment for renewable energy development.

Third, renewable energy has not been effectively utilized. Although the installed capacity of renewable energy, especially new energy power generation, is growing rapidly year by year, the responsibility and obligations of various market entities in the use of renewable energy are not clear, and the utilization efficiency is not high. The situation of “rebuilding and lightly utilizing” is more prominent. Unbalanced and uncoordinated demand, the potential for sustainable development of renewable energy has not been fully explored, and the proportion of renewable energy in primary energy consumption is still lower than that of advanced countries.

Fourth, energy efficiency and energy competitiveness are key factors in future energy development. How to improve energy efficiency and reduce energy consumption is a major problem facing China and the world at present. Accelerating the development of innovative energy and establishing a clean, safe and efficient energy economic system are the top priorities for improving China's energy efficiency and accelerating economic development. Improve the competitiveness of renewable energy in the energy market, especially in terms of electricity. Increasing the energy storage and use efficiency under the conditions of minimizing costs or controlling low cost can greatly enhance the competitiveness of renewable energy in the competitive market.

Fifth, the traditional power operation mechanism no longer adapts to the needs of large-scale

development of renewable energy under the new technological revolution. Strive to achieve full integration of artificial intelligence and energy and power industries. Artificial intelligence is the core influencing factor for promoting the fourth industrial revolution. It can not only optimize the industrial structure and improve productivity and management capabilities, but also form more complete and complex relationships with all aspects of energy and roles. Through the formation of the energy Internet, the Internet concept is fully integrated with energy and electricity to achieve sustainable energy development. In general, the technical path to solve energy sustainable development lies in two aspects, namely, increasing the development of renewable energy and energy conservation. By combining with artificial intelligence, the energy field, or specifically in the energy and power field, energy interconnection can be realized through energy and technology, thereby realizing the sharing, interconnection, high efficiency and marketization of the energy and power field.

CONCLUSIONS

With the accelerated transformation of the world's energy into green, low-carbon and clean, renewable energy has gradually become the core of global energy transformation, accelerating the pace of development of “low-carbon” renewable energy systems in the world. Under the background of low-carbon environment, countries around the world are increasingly promoting the promotion of clean low-carbon renewable energy, paying more and more attention to the development of green, low-carbon and clean environment, and increasingly placing renewable energy plans in Paris. Under the framework of the Agreement, cooperation in the field of international clean energy is launched.

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