

Analysis of the impact of global economy, society and energy development situation on power companies

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Abstract. At present, the situation faced by power enterprises is becoming more and more complex, which has profound impact on the development of power companies. This article analyses the global development situation from three aspects: economic development, energy development, and technological development. In addition, it analyses the transformation trend of world-class energy and power companies such as EDF, E.ON, TEPCO and ENEL. On this basis, it proposes the development characteristics of power enterprises in the future, which provides reference for strategic analysis and optimization of power enterprises.

1 Introduction

At present, the energy revolution, industrial revolution, and technological revolution are accelerating. The global political and economic structure is deeply adjusted. The situation facing by power companies is becoming more and more complicated. If power companies want to improve their core competitiveness continuously, it is necessary to conduct in-depth analysis and accurate judgments on the global economy, society, and energy development situation[1]. Therefore, this article analyzes the global economy, society and energy development situation, and proposes the development characteristics of power enterprises in the future to provide reference for them.

2 Analysis of the global development situation faced by energy and power enterprises

2.1 Analysis of Economic Development Situation

At present, the world is undergoing major changes and adjustments. Sino-US trade frictions have had a major impact on global economic growth. The growth momentum of the world economy is insufficient. The gap between the rich and the poor is becoming increasingly serious. The world economic growth rate has dropped significantly. Coupled with the spread of the new crown pneumonia epidemic around the world, the instability and uncertainty of the international environment have increased significantly. The world economy has fallen into a downturn, and many countries have negative economic growth. In order to promote economic recovery after the epidemic, governments of various countries may encourage infrastructure investment to stimulate

economic growth. Energy and power engineering investment is large, and the upstream and downstream chains are long. So the driving effect of the economy is very significant. Therefore, the demand for energy and power infrastructure construction may increase. In addition, the economic situation facing emerging markets and developing economies is improving. For example, China will contribute an important force to the world economic growth, and the demand for energy and electricity will continue to show a growth trend.

2.2 Analysis of Energy Development Situation

Marked by the signing of the Paris Agreement, countries around the world are actively responding to climate change. They control carbon emissions more proactively, and promote energy low-carbon development to a new level. At present, the energy development clean and low-carbon has become a global consensus. The global energy transition process is accelerating. As an important network platform connecting power production and consumption, the power grid is the central link of the energy transition and the core hub of carbon emission reduction in the power system. In the faster energy conversion, the importance of the power grid will increase. The “World Energy Outlook 2020” issued by the International Energy Agency (IEA) pointed out that renewable energy will meet 80% of the world’s new electricity demand by 2030. In the next ten years, the global demand for new transmission and distribution lines is expected to increase by 80% over the past decade. The “World Energy Outlook (2020)” by BP pointed out that the global energy demand will continue to grow for a period of time before 2050, but the energy structure will change fundamentally. Fossil fuels will continue to decrease, renewable energy sources will continue to grow, and electrification will play a more important role.

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Large power companies in various countries pay more attention to responding to the climate change and energy transition, and accelerate the energy development clean and low-carbon. AEP plans to reduce carbon emissions by 80% by 2050 compared to 2000. TEPCO restarts nuclear power, accelerates the development of offshore wind power, and pledges to achieve net zero emissions by 2050. EDF promotes the development of electrification of transportation. It joins the EV100 plan and builds the largest cross-platform charging service network in Europe. In 2030, the proportion of electric vehicles will achieve 100%. ENEL regards the hydrogen energy business as an important measure for carbon neutrality by 2050. As one of the world's major economies, China has established the goal of striving for a peak in carbon emissions by 2030 and achieving carbon neutrality by 2060. At the same time, it proposes to build a new power system with new energy as the mainstay. Therefore, from the perspective of global energy development trends, a clean and low-carbon transition of energy is an inevitable trend. New energy will continue to develop on a large scale. The level of electrification will continue to rise. The development of power grids will face more opportunities.

2.3 Analysis of Science and Technology Development Situation

In recent years, a new round of scientific and technological revolution and industrial transformation have developed in depth. Scientific and technological innovation becomes very active. On one side, the clean and low-carbon transition of energy puts forward greater requirements for innovative research on clean technologies for power companies, carbon capture and storage technologies[2]. On the other side, advanced information technologies are widely used, such as big data, cloud computing, internet of things, mobile internet and artificial intelligence. The energy revolution and the digital revolution will be deeply integrated. With the large-scale integration of clean energy and the extensive use of interactive facilities (such as distributed energy, energy storage, electric vehicles, and smart electrical equipment), the power grid will become more intelligent, interactive, and efficient. This requires power companies to play a more important pivotal role, integrating the entire energy industry chain deeply[3,4]. It will aggregate all elements, integrate advanced grid technology and digital technology, and create an electricity-centric smart energy system, to promote the maximization of energy resource allocation efficiency.

3 Analysis on the transformation trend of world-class energy and power enterprises

At present, the world's leading energy and power companies are undergoing transformations, such as EDF, E.ON, TEPCO and ENEL.

3.1 Analysis on the Transformation Trend of EDF

EDF is the largest state-owned power company in France. The business scope covers almost all links in the upstream and downstream of the power industry, such as power generation, transmission and distribution, natural gas supply, engineering and consulting. EDF has clarified three priority development directions in a medium and long-term strategic development plan to transform the energy structure actively and strives to upgrade into an Energy Internet company. Firstly, it promotes smart grid technology and Energy Internet industry models to adapt to new energy production and consumption changes. Secondly, it adopts low-carbon power generation. It balances the ratio of nuclear power and renewable energy power generation, develops competitive low-carbon hybrid fuels, upgrades nuclear power plants, researches new safer nuclear energy technologies, and accelerates the development of renewable energy. Thirdly, it implements international expansion. It continues to maintain the key role in the European power market, and strengthen the low carbon development. At the same time, it pays more attention on expanding business in the emerging countries.

3.2 Analysis on the Transformation Trend of E.ON

E.ON is the largest energy company in Germany. In recent years, Germany has accelerated the development of renewable energy, improved energy efficiency and reduced carbon emissions, which brought huge challenges to E.ON and other traditional power companies. In order to meet the challenge, E.ON announced that it will divest most of its power generation, energy trading and upstream businesses gradually. In a complex market situation, E.ON's renewable energy business has been developed on a global scale rapidly. At the same time, E.ON also develops a series of user solutions actively. It promotes energy efficiency technologies widely and provides high-quality value-added services, to cultivate them into a growing and sustainable business.

3.3 Analysis on the Transformation Trend of TEPCO

TEPCO is one of the most well-known large power companies in the world. The main business includes electricity, equipment maintenance, fuel supply, environmental protection, real estate, transportation, information and communication, etc. In order to respond to the challenges brought about by changes in the external business environment actively (such as the full liberalization of the power and gas market systems), TEPCO continues to expand traditional energy services, and provides a variety of power energy products and new energy services. It excavates the potential of customers' power consumption, combining with the development of Energy Internet-related technologies. TEPCO establishes a new strategic positioning as an integrated energy service provider. In addition, it builds a power transmission and distribution platform, infrastructure platform, energy

platform and data platform, to support the development of integrated energy service business fully. The construction of the four major platforms can break the traditional boundary among power system, other energy systems, and related systems outside the energy. It can realize the series and distributed interaction between the energy internal and energy external, which can provide basic support for transformation from a product-based enterprise to a platform-based Enterprise of TEPCO.

3.4 Analysis on the Transformation Trend of ENEL

ENEL is Italy’s largest power supplier. Its business includes electricity production and distribution, natural gas production and distribution, grid operation, operation and maintenance, energy retail, charging pile, and other related services. In the face of the world’s energy transition and the rapid development of energy technology, ENEL proposes a new strategic direction. It carries out research and practice on energy internet-related technologies actively. Firstly, it constructs smart meters and builds a data service network. Smart meters are the key equipment that connect end users and energy supply units. Based on the construction of smart meters, ENEL emphasizes the effectiveness of metering data and data solutions. It wants to provide effective demand management and value-added services through meter data. Secondly, it innovates distributed power generation systems, energy storage technologies and green transportation technologies. ENEL attaches great importance to improving the intelligent integration and management technology of distributed renewable energy on the distribution side. It attaches importance to the promotion of household energy storage technology. It devotes to provide more advanced and high-quality services for the integration of renewable energy into the power grid.

Table1. The transformation trend of world-class energy and power enterprises

Companies	Transformation
EDF	1) Promote smart grid technology and Energy Internet industry models. 2) Adopt low-carbon power generation. 3) Implements international expansion. 4) Pay more attention on expanding business in the emerging countries.
E.ON	1) Divest most of its power generation, energy trading and upstream businesses gradually. 2) Renewable energy business has been developed on a global scale rapidly. 3) Develop a series of user solutions actively. 4) Promote energy efficiency technologies widely and provides high-quality value-added services.
TEPCO	1) Continue to expand traditional energy services. 2) Provide a variety of power energy products and new energy services.

	3) Build a power transmission and distribution platform, infrastructure platform, energy platform and data platform, to support the develop.
ENEL	1) Construct smart meters and builds a data service network. 2) Innovate distributed power generation systems, energy storage technologies and green transportation technologies. 3) Devote to provide more advanced and high-quality services for the integration of renewable energy into the power grid.

4 Analysis on the characteristics of power enterprises in the future

In response to the global economy, society, and energy development trends, the development of power companies is expected to show the characteristics as follows in the future:

1) Clean. As the economics of new energy power generation increase, new energy will increase its substitution of traditional fossil energy. Clean energy will occupy a dominant position in energy supply and consumption gradually, and power companies will accelerate clean development. For power generation companies, the proportion of new energy power generation will continue to increase. For power grid companies, a high proportion of renewable energy will be connected. Due to the fluctuating and intermittent of clean energy, the operating characteristics of the power system will change. At the same time, on the consumer side, the electric energy substitution will accelerate, and the level of electrification will continue to increase.

2) High efficiency. The energy network will be widely distributed. Various facilities and entities access extensively, such as centralized and distributed facilities. Energy from different regions and with different types are connected to each other. Energy systems, information systems, and social systems develop together. Energy allocation and comprehensive utilization efficiency is high. Multiple energies are complementary, and energy system efficiency is greatly improved.

3) Intelligent. With the in-depth integration of energy and information technology, advanced information and communication technologies (such as big data, cloud computing, internet of things, mobile internet and artificial intelligence) will be widely and deeply applied in energy and power systems. Energy Internet technologies will be fully upgraded, such as multi-energy conversion technology, coordinated operation technology, and user interaction technology. A large number of new energy-consuming equipment will be used. Lots of subjects are easily accessible. Users will be deeply involved. A two-way interaction between various new loads and energy supply is gradually realized. The intelligence level of the entire energy system will improve.

5 Conclusion

At present, the situation faced by power enterprises is becoming more and more complex, which has profound impact on the development of power companies. This article analyses the global development situation from three aspects: economic development, energy development, and technological development. In addition, it analyses the transformation trend of world-class energy and power companies such as EDF, E.ON, TEPCO and ENEL. On this basis, it proposes the development characteristics of power enterprises in the future, which provides reference for strategic analysis and optimization of power enterprises.

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