

Establish “Ubiquitous Power Internet of Things” Create “Industry 4.0”

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ABSTRACT: In the development of human society, the Industrial Revolution has become an important turning point in history, a key factor to stimulate economic development, but also changed the world pattern and human life style. Now the age of Information Revolution based on intelligence has arrived. In this critical period, the completion of the digital process in the energy sector, the realization of the Information revolution, will directly affect the development of the energy sector Information revolution. The power grid is the basic platform of energy development and utilization, and the State Grid enterprises assume the important social responsibility. Through the construction of the power grid, the Internet of things will be integrated into the digital economy, complete the "Made in China 2025" and welcome the arrival of the "Industry 4.0".

1. The role of industrial revolution in China

In the history of the development of modern human society, there have been three industrial revolutions, each revolution will push the human society to a new height of development. Of course, the world's Lion China also benefited from the rapid development The widespread use of Watt's steam engine in Britain in the 1860s also had an indirect impact on China as it opened its doors to the world and learned advanced science and technology from the West. The development of the Self-Strengthening Movement, the dispatch of foreign students, the establishment of new schools, the planning of coastal defense, the establishment of Jiangnan Machinery Manufacturing Bureau, the rise of various types of enterprises in China, and so on, lead to the development of isolationism China. This industrial technology revolution is known as "Industry 1.0" and it was the age of the steam engine [1].

From the 1960s to the early 20th century, electricity replaced steam as an important energy source, marking the beginning of the Second Industrial Revolution. At this time, China's domestic and foreign troubles, world capitalism began to develop from liberal capitalism to monopoly capitalism. Imperialist aggression against China shifted from the production of goods to the production of capital, controlling the lifeblood of China's economy. This era is known as "industry 2.0" and it is the age of electrification [1].

The third new scientific and technological revolution came in the middle of the 20th century. Represented by the application of atomic energy technology, space technology and computer technology, major breakthroughs have been made in scientific theory and scientific and technological innovation, accelerating the development of the world economy. This is both an opportunity and a challenge for China. With China's reform and opening up, it adjusted the direction of development in time, caught up with the trend of the times, so that China's economy began to take off. This era is known as "industry 3.0" [1].

At present, the technological revolution based on artificial intelligence, clean energy, robotics, quantum information technology, virtual reality and biotechnology is rising quietly Known as the "Industry 4.0," this is an era of intelligence in which information technology is used to transform industries, and its arrival will dramatically alter existing modes of production and living.

In April 2013, at the German Hannover Messe, the German government officially launched the concept of "Industry 4.0" to speed up the process of intellectualization and increase its competitiveness worldwide. In March 2015, Premier Li Keqiang presented the first "Made in China 2025" grand plan in the NPC'S report on the work of the government. The "Made in China 2025" proposed an innovation-driven, green development, structural optimization and talent-oriented

development strategy to shift China from a manufacturing power to a manufacturing power and transform its economy from high-speed development to high-quality development To show the world the wisdom of China.

2. The influence of industrial revolution on China's electric power industry

Since the mid-1980s, China's power system has undergone three major reforms. The first is reform of the investment system. From relying solely on government investment to introducing foreign investment, encouraging private capital to invest in power construction, solving the problem of power construction funds, has greatly promoted the development of power supply. Second, the separation of factory and network reform. In 2002, the State Council issued document No. 5, which clearly proposed that the former state power companies should be divided into seven according to the principle of "separating plant networks and bidding on the Internet", and establish two power grid companies and five power generation groups. This reform adapts to the rapid growth of the national economy and the surge of the demand for electricity, which makes the construction scale of the power grid reach an unprecedented level. The third is a separate reform of resettlement. At the heart of this reform is the dismantling of grid companies in the power production, transport, trade and consumption chains. Power sales, regulation of natural monopoly, liberalization of non-natural monopoly, introduction of competition mechanism, market determines the allocation of power resources. These three reforms have a far-reaching impact on the development of the electric power industry and the national economy as a whole [3].

Every reform faces changes in management systems, models and processes. Prior to the first reform, the power companies were managed in accordance with government management functions and were managed and developed as functional units. GOVERNMENT-ENTERPRISE MERGER MODEL, provincial, municipal and county-level power companies relatively independent, investment and construction funds shortage. After the reform and opening-up, the power investment channel is strengthened, the power grid construction strength is strong, the power grid scale is expanding day by day. With the second reform of the power system, China's power industry has formed a unified power management industry dominated by the two major power grid companies and the five major power generation groups, making the management of the power industry more standardized, professional, and also adapt to modern enterprises. The management request has formed the consummation management business process, the province, the city, the county electric power management department has changed from the function management to the process management.

3. Basic function of electric network

In the process of digitalization developing to intelligentization, a new technological revolution will be set off. This year, the State Grid Corporation of China (SGCC) proposed the comprehensive construction of the "ubiquitous power internet of things", which is part of the "Made in China 2025" and an important strategic layout for SGCC to go to China and realize the "Industry 4.0".

After more than 140 years' development, China's power industry has realized Regional Power Grid Operation Structure and regional balance of China's power energy. The Electric Power Industry has become an important basis for China's energy transformation and upgrading. Information, digital and smart devices and technologies will be widely used in the power industry. One end of the grid is connected to energy production, and energy consumption is the basic platform for energy development and utilization [5]. It will closely link energy production and energy consumption, lead the pace of the industrial revolution in the energy field, become the forefront of the process of power digitalization and information, will become the leader of the Digital Economy Era.

The grid integrates modern information technology and communication technology into one, which will eventually realize a powerful smart grid carrying power flow and ubiquitous power Iot, carrying data flow, complementing each other, integrating development, and forming a powerful

platform for value creation Together constitute the "three-in-one" energy process, business process and data flow.

4. Formation and transmission of energy flow in power grid

As a power system for power production, transmission and distribution, a certain scale of energy flow has been formed since its birth. Electricity from a variety of producers is converted into electricity by chemical, physical and other principles, and voltage and current are converted at all levels by a network of power lines and substations And will transmit electric energy to all kinds of electric energy users.

With the construction and operation of China's UHV backbone power grid, a unified power system network has been formed in China. All power production, transmission and power equipment in the network is physically connected. Power plants and power customers balance energy production and demand through the power network. The Electricity and energy flow generated by the regions and power plants is continuously transmitted to the regions, enterprises and users who need electricity. Energy flow has existed since the power grid was formed, and is influenced by market demand and power grid development. It is the backbone of the power company's special "economic life".

5. The important process of constructing "ubiquitous power IOT"

In August 2009, Premier Wen Jiabao visited the "China sense" in Wuxi to begin the concept of the Internet of things. As a new information industry, the Internet of things has been widely used in smart home, smart logistics, smart health care, Smart City, smart grid, business intelligence, smart industry, safe city, etc.

In order to build ubiquitous power IOT and realize its full application, it is necessary to solve the problem of digitalization of equipment status and service information. Digitalize all types of equipment, resources and services in the production, transmission and consumption of energy in power systems, and use all kinds of smart meters, smart switches, collectors, sensors, online monitoring equipment, digital Substation and digital distribution. Electric Cabinets and other terminal equipment collect real-time data of energy production, energy transmission, energy consumption and other related equipment, complete digital processing of all kinds of information, use modern information and communication technology to achieve data sharing in various power networks, the function of all kinds of information is to spread it effectively. Information and data exchange between related devices is formed in power system to achieve the goal of overall perception and to form ubiquitous physical meaning of Internet of things.

The second is to achieve a rapid flow of information within the power system. It is to collect all kinds of data in the power system, and form the big data system in the field of power. Depending on the advanced information and Communication Network, all kinds of data and information of big data system can be transmitted to all kinds of application systems effectively and quickly. At this stage, it is necessary to realize the layering, grading and subsystem application of various data and information resources to form a complete "source-web-site-line-change-household" information network It also plays an important role in the timeliness and spaciousness of informatization.

Thirdly, it is to realize the intelligentization of Electric Power Company's business network. It uses modern information and communication technology to achieve comprehensive data sharing, the entire field of information flow, to achieve various types of business network collaborative work. Based on big data artificial intelligence (AI) system, AI is widely used to support the state of the main equipments and systems in power network in real time. Ai Aided decision analysis system is suitable for various business fields, such as power network dispatching decision making, equipment state maintenance Intelligent robot detection, E-commerce Platform System Platform, integrated energy services.

State Grid Corporation of China (SGCC) is the strategic plan for the development of National Energy Industry to build "ubiquitous power Iot". It will construct and apply the existing resources,

realize all aspects of the power system interconnection, human-computer interaction, with a comprehensive national awareness and information efficiency. The development, construction, application and practice of smart service systems that are easy to process and apply is a systematic growth process.

6. The significance of “ubiquitous power IOT” in the field of electric energy

With the advent of the intelligent age, a new round of technological revolution and industrial transformation is accumulating strength, greatly changing and promoting the changes in the economic, political and cultural fields of human society, profoundly affecting people's way of life and way of thinking.

The State Grid Corporation of China relies on the intelligence to build the Internet and the power grid and realize the integration of the two networks, which is an important strategy to cope with the transformation of the world economy, and is a revolutionary revolution from concept to technology and management. Achieving high efficiency, quality and integration of power generation means that state grid will rebuild the industrial ecosystem of the power sector. It is finally reflected in the new concept of customer-centered development, breaking down the industrial barriers in the energy sector, the liberation and development of social productivity in the energy sector, and the rapid development of the national economy as a whole.

State Grid Corporation of China (SGCC) plays an important role in maintaining national energy security, promoting the construction of ecological civilization, enhancing the comprehensive strength of the country and serving the improvement of people's livelihood. It has become a leader in the energy sector in the digital economy era. "Ubiquitous Power Internet of things" is the State Grid Corporation of China using its powerful power network and modern information and communication technology to realize the interconnection of all aspects of the power system, to achieve a comprehensive state perception, inter-entity Coordination and interaction, and the networked sensing and Feedback Control System of mutual objects. Through the existing smart grid and Ubiquitous Power Iot, energy flow, business flow and information flow are integrated together to achieve the digitization process in the energy field, to achieve the "Made in China 2025" , to meet the "Industry 4.0" .

7. Summary

The construction of the "ubiquitous power IOT" by the State Grid Corporation of China is aimed at speeding up the information process in the field of power and energy and improving the results of the Digital Revolution of the power industry. In the era of information and intelligence, it is an inevitable trend for human society to rebuild the new economic system of energy industry and Bring Electric Energy into the digital economy to meet the coming of Information revolution. This change will inevitably carry on the comprehensive reform to the State Grid Corporation's management system, the business model and the service idea. This is also the concrete embodiment of the Central Committee of the Party and the State Council. In the new historical Opportunity Period, the State Grid Corporation of China (SGCC) has advanced the reform pace in the field of energy and adapted to the trend of economic and social development. This change is in line with the requirements of the development of the times, using Internet thinking, local conditions and "basic gas" specific measures. To adapt to the direction of economic and social development, to achieve the liberation and development of social productive forces in the energy sector and the high-quality development of the entire industry, and to realize the national development strategy of "made in China by 2025" , the completion of the Energy Industry Four Industrial Revolution laid the foundation.

References

- [1] Why did Li Keqiang mention Industry 4.0?

- [2] The company comprehensively deployed the ubiquitous power Internet of Things construction
- [3] "Forty Years of China's Power System Reform: Retrospect and Prospect" Jiang Debin
- [4] "On the Domain Paradigm of Economics"
- [5] "China's Party and Government Cadre Forum", No. 3, 2008 Interview with Zhang Zhuoyuan
- [6] "The Principles of Management" (US) Daft, (US) Masik: Mechanical Industry Press, 2010-3
- [7] "General Build Outline of Power Internet of Things" State Grid Internet Department
- [8] "Promoting the high-quality development of the national grid with structural reforms on the supply side"
- [9] "Accelerate the process of electrification and promote green development" Shu Yinyu
- [10] "Implementation and Significance of Informatization Construction in Enterprise Management"
Liu Zeng
- [11] "Database Principles and Development and Application" (Second Edition) Zhou Wei Li
Yanjuan
- [12] "On the Role of Information in Enterprise Management——Discussion on the Construction of
Management Information System of Agricultural Machinery Company in Zhaotong City" Wu
Wengao
- [13] "Comply with the trend of the times and achieve common development" Xi Jinping