Analysis of Information and Communication Technology Based on Energy Internet

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Abstract: With the development of science and technology, the utilization and development of renewable energy has gradually become a new trend, and is oriented to the global renewable energy development field. With the development of renewable energy, there are also some problems, such as how to improve the system efficiency and flexibility of renewable energy, and how to realize the extensive interconnection of renewable energy distribution. These are the needs and problems we are facing. As a result, the Internet industry is based on the concept of the Internet and has become the main direction of renewable energy development. Therefore, great changes have taken place in the energy internet, which will make significant changes in energy allocation, development, production, life and consumption. These major changes require more stringent and comprehensive requirements for communication information systems. Let's analyze the energy Internet information framework, which is a general framework of energy Internet communication information based on electric energy. It takes energy Internet as the application background, so as to introduce the process.

1. Introduction

At present, the Internet has been used and covered by human beings all over the world, and the human life and production industry is constantly changing. With the promotion of Internet technology, at the same time, our Internet is constantly penetrating into all walks of life. Based on this development direction, many countries have put forward some relevant strategies for development and progress, which are Internet-driven industrial technology. For example, China's strong and intelligent power grid, Internet +, Germany's industry 4, the United States's third industrial revolution and industrial Internet revolution, and China made 2025 and so on[1]. And the most important characteristic of these development strategies is that we use Internet of Things technology, Internet technology and communication technology to reform our traditional industries.

In recent years, it is obvious that the utilization and development of renewable energy will become the main direction of energy development in the world. At the same time, we are facing the problems of how to improve the efficiency and flexibility of energy system and how to realize the large-scale interconnection of Distributed Renewable energy. Energy Internet has become the main direction of development, based on the concept of the Internet[2].

2. Energy Internet Information Communication Requirements and Characteristics

2.1. Basic concept

We can know that the energy Internet has its own peculiarities, such as the information in our database is very complex, and its security performance requires high technology and so on. Since there are problems, we need to solve and improve them. First, we need to recognize the characteristics and characteristics of mobile energy internet. Our energy Internet has the characteristics of openness, integration, complexity and decentralization. The basic guarantee is security. The key of information transportation lies in mobile communication[3]. Energy Internet with self-healing capability has some functions such as real-time fault measurement, real-time emergency analysis, automatic control recovery, online evaluation and prediction, etc. Our energy Internet system must have a defensive function outside. Only in this way can we isolate the problem from the system, so as to deal with the

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functions of automatic recovery control and emergency analysis. Our energy Internet information network system and energy internet physical system have defensive capabilities, so as to defend against external attacks and enable the system to quickly restore power supply and transportation. OK, you can isolate units that already have problems from the system. Our information and communication technology, whose reliability needs to be linked to energy availability and renewability, will become an indispensable part of the energy Internet architecture. Nowadays, the energy Internet has developed to a certain extent in China, and it will develop rapidly in the future[4]. But for our enterprises, we should pay more attention to the guarantee and reliability of ICT. For example, we take the power system as an example, we should realize its openness, high security and hierarchy, in order to promote its sustainable development process.

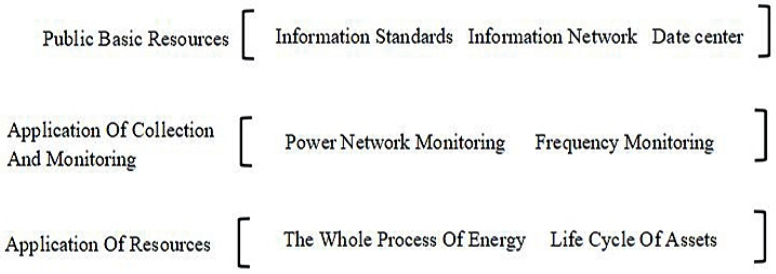

Fig.1. ICT system of energy Internet

2.2. Characteristics of Energy Internet Information Communication

We should have the ability of flexible access to the network and diverse information acquisition. Our information and communication technology should be able to adapt to a variety of environments, so as to achieve networking and information communication functions.

It should have efficient data transport function, so as to realize information sharing. Because efficient network transmission capacity requires large capacity storage, the development of energy Internet must require large capacity storage[5].

Should have efficient data processing capabilities, our energy Internet must have to deal with large-capacity data problems, so we need to analyze and screen the data.

We should have efficient decision-making ability. The main function and function of our energy Internet is to distribute and integrate energy resources in different places so that resources can be used reasonably. However, efficient decision-making ability is the key to achieve the goal.

Should have network information security technology, energy security is almost related to the interests of individuals and the interests of the country, so the energy Internet is an indispensable link to ensure the safety of the network[6].

3. Overall Framework of Energy Internet Information and Communication

The information and communication network supporting the global energy Internet needs to be ubiquitous, open, interactive, intelligent and credible. The next generation electric power information communication network is an integrated communication network consisting of ubiquitous wireless, satellite communication and ground wired communication technologies; backbone communication networks consisting of OTN/WDM, SDH/MSTP; ubiquitous access networks consisting of 4G/5G, white space, long-distance Wi-Fi and EPON/GPON wired communication technologies. Supporting the development of new energy in complex environment such as ocean and desert, supporting the friendly access of distributed energy, forming plug-and-play communication services, and realizing the transformation of "supporting business internally and serving the public externally" of information and communication[7].

The "decision analysis layer" at the highest level is similar to the "brain" of the human body. It

processes, coordinates and processes information with advanced information technologies such as big data, pattern recognition and artificial intelligence by receiving information from the whole body of the power grid. It becomes a decision signal for coordinating the overall action of the power grid, or it is stored in the brain as a nerve for learning, memory and "thinking" of the power grid. Basis; "acquisition and monitoring layer" is similar to the human body's "sense" system, through on-line digital acquisition of power grid related equipment and line status, constantly sensing the various states of each link of the smart grid, on-line monitoring and control of real parameters, and under the control of the brain (decision-making and analysis layer) to complete all external responses; "process operation layer" is similar to human body's.“

The "nerve" system, which processes, processes and feeds back all external information perceived and collected by the end of the power grid (acquisition and monitoring layer) at the basic operation and process level, achieves efficient management and control of the system or equipment. In addition, it also gathers part of the information processed into the nerve center and plays a connecting role; the "public basic resources layer" is similar to the human body. The healthy body supports the basic realization of the above-mentioned functions, including the realization of all kinds of data security transmission communication information network, all kinds of data storage and processing data centers, and the realization of enterprise portals for all kinds of data display, among which the strong network structure and wide coverage of information communication network are the basic elements to support the reliable transmission of information in the future power grid. "Network and Information Security Layer" is similar to the strong immune system of human body, and it is an important support system of the power grid[8]. It runs through all the production links of the power grid. Through such measures as "attack", "prevention", "detection", "control" and "management", it achieves all-round information and communication security guarantee.

The above five levels of information and communication technology promote the support of energy Internet from four aspects: platform centralization, security and real-time, business integration and decision-making intelligence.

Local information centralization is of great significance to make rational use of network spectrum resources and time resources and reduce transmission overhead.

Considering the influence of concentrator, some researchers have simulated the performance estimation of intelligent measurement infrastructure of power grid, and uploaded data in local centralization. Based on PMU devices, the flow of Wide Area Smart Grid Monitoring System can be reduced by optimizing the installation of phase concentrator. In addition, different levels of data centralization also affect the performance of remote monitoring and control systems, such as end-to-end communication delay[9].

Because of the huge amount of data collected by the energy Internet and the existence of noise and loss, data centralization will be a valuable work. Future data sets will focus on improving the performance and efficiency of local information processing, noise reduction, and extracting essential characteristic data.

Sensing function usually uses embedded sensors (or sensor networks) to monitor or control the main equipment, lines and environment in the power grid, and collect the state, electrical or measurement of the equipment.

Internet of Things (IOT) sensor networks for power have been extensively studied, including information models and applications, which can help data packets avoid routing protocols in congested areas and security issues in networks. Based on sensor networks, web services for power grid demand side energy management are also proposed, which can save energy for smart home.

On the one hand, by building an integrated information and communication platform (information and communication network, data integration and sharing platform, large data platform, cloud computing service platform, etc.), we can realize the collection, transmission, storage, processing and display of information in the six links of power generation, transmission, substation, distribution, power consumption and power grid dispatch, and realize the deep integration of power flow and information flow through the regulation of the six links. Planning, design, construction, operation and management of the whole chain of information support, to achieve close cooperation between power

flow and business flow, efficient operation. On the other hand, we should continuously improve the omni-directional service capability of information communication (terminal access capability, communication exchange capability, data storage and processing capability, access channels, etc.), build an open, interactive and decision-making intelligent application system for power network business, promote the deep coverage of information communication for power network full-service applications, and realize the high sharing of information flow and business flow. By giving full play to the role of ICT's "smart system", the information of power grid production and operation can run through six links as well as the whole process of production and operation, such as planning, design, construction and operation, so as to realize the integration of power flow, business flow and information flow.

4. Conclusion

This paper expounds the concept and characteristics of energy internet, and focuses on the key technologies of energy internet. The main conclusions are as follows: in energy internet, energy storage technology will play an important role in new energy generation, improving the flexibility and stability of energy internet, providing support for energy management and path optimization of multi-energy system, improving the economy of power grid operation and promoting the transformation of energy trading mode.

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