Study on Global Interconnection Feasibility of Energy Internet

Yicong Liu [a], Zongqi Liu

School of Electric and Electronic Engineering, North China Electric Power University, Beijing 102206, China

[a]lycncepu@163.com

Abstract

State Grid Corporation of China proposed the construction policy of global energy Internet in 2014. This new grid idea will change the conventional structure of the global energy. This paper first elaborated on the concept of energy Internet that State Grid Corporation of China put forward, and contrasted to Jeremy Rifkin's concept. Then introduced the State Grid Corporation energy Internet planning and current implement situation. On the basis of this, to discuss the global energy Internet construction important issues. Finally, it is concluded that as a part of the construction of the global Internet of Things, the energy Internet is more feasible for local interconnected, but the overall global Internet is still facing great challenges.

Keywords

Energy; Global Energy Internet; State Grid Corporation of China; Local interconnect; Internet of Things.

1. Introduction

The concept of the Internet and the "Internet plus" is the hottest search term at present. From the birth of the Internet to the rapid development in 1990s, internet experienced the PC era and the mobile Internet era, every new application has reshaped the social production and life form. "Internet plus" represents a new social form, that is, gives full use of the Internet in the allocation of social resources and the integration of economic and social areas, to enhance the innovation and productivity of the whole society and form a broader form of economic development based on the Internet as a means of infrastructure and tools. The Internet itself improves the utilization efficiency of information flow, multiplying efficiency will create a new output value. The Internet has penetrated into various traditional industries. Energy industry as a pillar industry of the whole society is no exception [1].

2. Concept of Global Energy Internet

Numerous scholars at home and abroad began to think about how to transform the energy industry, which is regarded as sunset industry of the traditional industries. Many different ideas are presented. These different ideas have a common name, Energy Internet [2].

2.1 Jeremy Rifkin's Concept

Jeremy Rifkin put forward the concept of energy Internet in his book *The Third Industrial Revolution*, which received worldwide extensive attention. In Jeremy's concept, the distributed renewable energy is chosen as the main primary energy, the Internet technology is used to achieve the coordination of power, energy storage equipment and load in wide area [3].

2.2 Zhenya Liu's Concept

China State Grid Corporation former chairman Zhenya Liu proposed to build global energy Internet in 2014, and the Global Energy Internet Group was set up in China in 2016. Although it is similar to Jeremy Rifkin's concept, its essence is very different [4].

The concept of energy Internet proposed by State Grid refers to the strong global interconnecting smart grid which takes the UHV power grid as the backbone grid, mainly transports clean energy. Its core lies in the use of UHV power grid to achieve long distance power transmission. The global clean energy, wind energy is rich in the North Pole and South Pole, solar energy is more abundant in the vicinity of the equator, which is not overlapped with population-intensive areas. This situation is also common in a nation scope. Therefore, using the advanced UHV transmission technology of China to transform the wind and solar energy from these rich areas to the needs has become the only viable solution to efficiently use clean energy [5].

3. Planning and Present Situation of Global Energy Internet Project

3.1 China State Grid's Global Energy Internet Planning

According to the State Grid planning, the global energy Internet construction is divided into three stages.

The first stage is domestic interconnection. By 2020, we will accelerate the development of clean energy and the interconnection of domestic power grids.

The second stage is continent interconnection. From 2020 to 2030, large-scale energy bases construction and transnational grid interconnection will be promoted.

The third stage is intercontinental interconnection. From 2030 to 2050, to speed up the arctic wind power and equatorial solar energy bases development, basically complete the global energy Internet [6].

3.2 Achievement at Present

The Global Energy Internet Group Co., Ltd. (hereinafter referred to as the "Global Energy Internet Group"), funded by the State Grid and registered capital of 100 million yuan, has been approved by the Beijing Municipal Administration for Industry and Commerce. Zhenya Liu, the former Chairman of the State Grid, is the Global Energy Internet Group corporate representative. Global Energy Internet Group's business scope is the global energy Internet strategic planning, transnational interconnected power grid project development, investment, financing and asset management [7-9].

4. Challenges

4.1 Political Factors

Such a huge project, must face the difficulties, the first is the political impact. In many regions of the world, peaceful coexistence between countries is in a very subtle state, give the control right of power, which is the country's lifeline to others need deep trust. Such as oil, each country needs "war reserves" [2] to ensure that in the event of war, when the marine oil lines were cut off by the enemy, the social operation can still be maintained for some time. Oil is a resource that can be stored, so that countries attach great importance to it.

In the era of energy Internet, the world will be more electrified, such as internal combustion engine vehicles may be gradually replaced by electric vehicles. At that time, the destruction of power networks may directly leads to the whole country shut down. As mentioned, attack a country, directly cut off its energy Internet. China and the United States have signed an agreement not to attack each other's power networks in wartime. Each country that participates in the energy Internet, either like the United States and Canada, has little conflict of national interests, or building large energy storage

facilities as combat readiness [10]. Sufficient energy production reserve should be guaranteed as well to prevent the crisis of energy being cut off in wartime.

Conversely, if the construction of a large transnational energy Internet achieves, wars may be more difficult to occurr, which is conducive to establish community of common destiny. And that's requires the efforts of the political elite.

4.2 Technology Factors

Technology, the general understanding is that the current technology and capital is not a problem. Still, large-scale wind power and photovoltaic grid connected have many technical problems need to be overcomed. The stability of these intermittent energy needs for a large number of traditional generators to adjust. The coordination between the large number of units, as well as the distribution of the transfer channels, coupled with the complex response of the load, require a high-efficiency intelligent grid to allocate [11].

Compared to the Internet that only deals with the flow of information, the energy Internet involves a large amount of energy flow and information flow handling, which poses a greater challenge. The current implementation of the energy Internet project needs to achieve a large amount of clean energy long-distance transmission and wide-area distribution. This makes fast and broad demand response an indispensable technology. Consumers' real-time data collection, processing and analysis, guiding the consumers to achieve demand side response, remote adjusting the generators according to real-time power demand, etc. will be the tests of energy Internet basic technology.

4.3 Human Factors

Most importantly, this is a very ambitious career involving trillions of dollars of capital, consuming generations of youth, may be able to achieve. How much difficulty will be faced is unknown. Sustained efforts to overcome technical, economic and political challenges are needed. Test whether people interested in this are willing to face the heavy test and probable desperation.

5. Conclusion

Electricity substitution is the next big trend in the world. Especially with the increasing popularity of electric vehicles, energy storage technology continues to develop, the world will complete the second industrial revolution unfinished business, the overall electrification. With the information technology and UHV technology, optimizing the allocation of the power generation side and the demand side will inevitably reduce the cost of energy transfer, just as informatization to reduce the cost of information flow. This is a wonderful idea, perhaps, this will be a part of the whole world next construction stage of Internet of Things, a larger part of the revolution of the Internet of Things. Material, energy and information intertwined, faster interaction and transformation, will make human society go further, to achieve information of all kinds of items seamless transfer.

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