Research on Development Strategy of Urban Power Grid Based on Energy Internet Construction

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Abstract. This paper mainly describes the content of the construction of the demonstration area, from the energy supply / consumption form, bearing the main carrier transporting the energy, decision management and public services and other aspects and energy Internet application framework model is constructed, supports a wide range of power flow of AC / DC active distribution network, hierarchical partitioning of the distributed intelligent control management and open public service mode is described in detail in the paper, discusses the overall strategic planning of the urban energy Internet.

Introduction

The development trend of the state power development and the economy and formulation of urban will inevitably affect the development of the electric power enterprise environment and the development direction. With the rapid growth of economy and slow development of urban power grid, growing contradiction between supply and demand gap is gradually apparent. The lag of the power supply network not only has a restriction on urban development, also limits the economic benefit and the social benefit. So, reasonable development strategy researches of power system, not only expand the scale of power system and improve the power supply ability of urban power grid but also obtain great social benefits and economic benefits. Therefore, the ability to improve the power supply, power supply quality and the reliability of power supply at the same time, It is very necessary to improve the economic benefits of enterprises and complete corporate social function. Under the background of the third industrial revolution, the Internet of energy is a new system of energy utilization combining with the new energy technology and information technology[1]. Compared with the smart grid, the Internet of energy increasingly emphasis on a variety of forms of energy use, but compared with other forms of energy, the Internet of energy has prompt and transient characteristics, in the future the electricity will inevitably become the main body and the smart grid will become the main carrier of energy ecosystem. At the macro level, through across continents and ac/dc transmission technology can realize energy domains interconnected and build a global energy mutual couplet net[2-4], and focus on distribution and the use of link. Through many energy joint controlling the active power distribution network technology construct urban energy Internet[5], and global energy and urban energy Internet can complement each other.

Situation of City Power Grid and the Main Issues

Grid Development Environment

In recent years, the materials prices which is rising year by year are affected by the price of the device, the cost of land is various each other because of substation positions, coupled with changes
in the national electricity policy and increased power equipment investment, resulting in the power falling corporate profits.

With the rapid development of the economic and long period of electric power construction, the current situation of contradiction between supply and demand are needed to face, increasing household consumption level and intensive public places make new requirements about the power supply quality and reliability.

**Grid Problem**

In recent years, the power grid of many cities through continuous construction and transformation, network infrastructure and power grid capacity has been greatly improved. But there is a large gap compared with the requirements in the grid network structure, equipment and technology and other aspects. For example power shortage problem is not completely resolved and there is still a phenomenon of power cuts. In addition to thermal power has higher average utilization hours. Most major urban power grid problems.

**Grid Structure is Unstable**

In different voltage levels, the lower level lacks the necessary support to a higher level grid. Some cities. Urban fringe cables and overhead lines segmented radial structure, cannot be transferred with each other, sub-branch less switches, wiring or an accident during maintenance, power range, low reliability, contact needs to be strengthened. Part of the line power supply radius is too long! Attachment capacity, we need to continue to make adjustments, transformation. Especially in the early part of the city network substation built substations are conventional substation, open layout, a lower level of equipment "In recent years, with the gradual aging equipment, a threat to the safe operation of power is also growing. The original part of the old city network substation needs to be gradually updated and improved, and improve equipment standards, in order to ensure the safety of power supply.

**Power Grid Capacity is Low**

Due to the few power distribution points of part of the city, 10kV distribution lines power supply radius is larger, tie line turn for small capacity, operational flexibility is bad. Center city substation export cable channel capacity is small, 10kV single cable in the export accounted for a large proportion, low voltage power network equipment is aging, overload and frequent accidents are seriously happened. The existing low voltage lines is more in bare, trees line is contradictions, the section of subscriber line is small, old measurement table is multi, capacity is small, with accident in peak load, some residents living electricity voltage is low.

**Power Grid Equipment is Aging**

Due to the time earlier operation of some parts of the city, part of the substation equipment has been aging, and out of line knife gate equipment poor contact, fever and other problems often occur. Especially some rural power substation construction. The import line switches is of bad contact, fever and other problems often occur. Especially the part of the construction of rural substations. Overall ideas of urban energy Internet

**Based Framework Design of Energy Internet**

Different with the global energy Internet concern, the Internet is more concerned about the allocation of energy and comprehensive utilization of energy. Therefore, it will be roughly divided into energy production and consumption, energy transport layer, integrated energy management platform, application layer. As shown in Figure 1.

Innovation demonstration area of the building will focus on the four tier architecture of the Internet to carry out the work: In the energy production and consumption level, we are exploring new energy production and consumption patterns through the flexible load response distribution of energy consumption and fully support the new rural energy comprehensive utilization. In the energy distribution layer, we build the construction of AC and DC hybrid distribution network and low
voltage DC power grid and the construction of active power distribution network. We build the multi-source data platform and the construction of energy management and public service, and we implement the coordinated optimization of the energy Internet, provide public services for the society and the users.

Master Plan Design

Yanqing area take regional energy planning as new energy during the "Twelfth Five Year Plan" and has built a number of new energy power generation projects, with a good foundation conditions. As shown in Fig. 2.

In Fig. 2, the three regions respectively Badaling Economic Development Zone, Yanqing town Beijing global new department store, Yanqing Jing Zhuang Zhen Liu Gou Cun. 4 aspects are energy production and consumption level, energy network transmission and distribution level, energy management optimization and public service level, energy Internet construction and operation of the business model level. 5 projects were multi-source collaborative active distribution network (item 1), Low voltage direct current power network (item two), flexible load active response (Xiang Musan), new rural multi energy comprehensive utilization (project four), energy management and public service center (item five). The first 4 projects constitute the core carrier of the entire energy Internet system, the project five of the global energy optimization analysis and decision-making, constitute the smart hub of the energy Internet.

Figure 1. Energy Internet infrastructure framework mode.

Figure 2. Demonstration project engineering drawing.
Primary System Construction

Active AC and DC Distribution Network

Since controlling of different target, micro-grid is activated by AC and DC distribution network, which will enable distributed power in less WAN trend range scheduling. AC hybrid distribution network will be the future active distribution network to achieve one of the important forms. The use of a flexible ring connecting a plurality means to provide dynamic reactive power support, in the face of equipment overload or trouble shooting, the economy can safely achieve load transfer. The transfer process significantly reduce short-term supply disruption. AC and DC distribution network can significantly improved reliability and equipment utilization distribution network.

New energy valley microgrid group in the economic development zone of Badaling is the largest smart micro-grid base in our country. New Energy Valley has been building 29 micro-grid smart micro grid demonstration project which is all-green power mode. Yanqing district flexible load active response demonstration construction

Demonstration sites have a wealth of flexible response to demand-side resources, including roof PV 1.52 MW, central air conditioning 765kW, electric boiler 300kW, the latter part of the construction of power / cooling / heating pipe thermal energy storage system and facilities. Through photovoltaic, air conditioning, electric boilers and other types of flexible loads can be more complementary to store the converted, Cascade utilization control means, responsive demand side controlled mining resources, the use of different energy sources and energy differences in the time domain, can improve system energy efficiency, random fluctuations stabilize intermittent new energy, high penetration of distributed renewable energy fully consumptive.

In the area demonstration project goal is to build a flexible demand-side load integrated management system. Controlling and optimization of energy through the two-way information exchange energy management and public service center. The flexible demonstration of load management to optimize resources, enhance absorptive capacity Yanqing locally distributed renewable energy, and improve the overall operation of the integrated demonstration efficiency.

To achieve the above functions of the system, a flexible demand-side load management system is equipped with an integrated sound system solutions: Combined with flexible operation and response characteristics of resources, resources are available to assess the flexible system responsiveness, while considering the dynamic response time difference between the different energy sources, the ability to fully exploit the complementary alternative between different forms of energy, to achieve an orderly, more energy optimization, flexible controlled load voltage regulation.

Conclusion

Through the upgrading of the existing distribution network, building in active distribution network and building urban energy Internet, can we significantly improve the energy transmission network optimizes configuration ability, achieve a variety of energy collaborative optimization, and support energy collaborative optimization control, improve the regional energy security, efficient utilization.

References