

Microgrid —The Core of Intelligent Distribution Network

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Abstract: This paper mainly introduces microgrid. It is the core of intelligent distribution network. In today's energy shortage situation, microgrid has been widely concerned around the world. It can effectively solve the problem of the impact when the distributed power grid connected to the power grid, which improves the stability and economy of power grid operation, and can provide different levels of power quality for different users.

Background of Microgrid

With the development of economy, the demand of electric power is increasing rapidly, the current power grid has been unable to meet the needs of users with more and more high security, reliability and diversification of power supply. But the traditional power grid is closely linked, so that through macroeconomic regulation and control, we can create a unified transmission and distribution system, improving economic efficiency. However, interconnected power grid also cause lots of problems, such as: the load can not be flexible tracked, which impact of the system to determine the state of operation; local accidents are easy to spread, which cause large area power outages, bringing a great threat to the safe operation of the power grid; power supply is difficult in remote areas, and is not economical; environmental pollution is serious and so on. In addition, faced with the depletion of fossil energy, and the world's voice for energy conservation and emission reduction, we're starting to look at the distributed generation, which is small investment, clean and environmental protection, high power supply reliability and flexible power generation. However, there are many problems in the distributed power access to the power grid, such as high access costs and single DG control, a large number of access will lead to power quality problems. In order to make the best use of the economic benefits brought by the distributed generation and the advantages of energy and environment, and to minimize the technical and market problems caused by the grid connected, the concept of microgrids is proposed.

Definition of Microgrid

Microgrid is a relatively traditional concept of large power grid. It refers to a network consisting of a number of distributed power sources and their associated loads in accordance with a certain topology, and is related to the conventional power grid by the static switch. CERTS (Consortium for Electric Reliability Technology Solutions) first gave the definition of microgrid. The microgrid is composed of a load and a distributed power supply, and can provide power and thermal energy. It adopts advanced power electronic devices to achieve energy conversion and system control. Compared with the large power grid, the micro grid is a single controlled unit, which can better meet the needs of users. The definition given by European Commission Project Micro-grids is: using primary energy; using micro power, is divided into three kinds of uncontrollable, controllable and fully controlled, and can be cold, hot, electric triple; equipped with energy storage device; using a power electronic device

to adjust energy.

Several key factors that the microgrid must possess are as follows: must be based on distributed generation technology, fusing energy storage device, control device, and integrated unit of protection device; microgrid should be close to the user terminal load; access voltage level is distribution network; can work in two modes of grid and qualification.

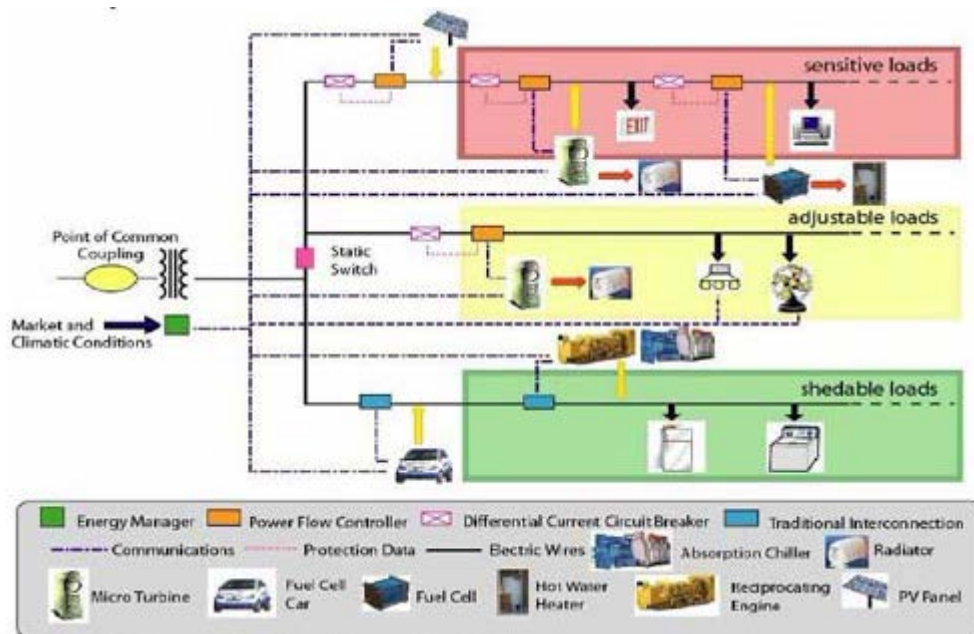


Figure 1 Typical Structure of Microgrid

Characteristics of Microgrid

Autonomous. It can be used as a small energy network and will maintain energy balance; it can be in a good conditions without the main grid, not depending on the energy supplied by the grid.

Stable. Based on real time communication, fast control and energy storage units, power balance and voltage and frequency stability can be achieved in the process of steady state and transient state.

Compatible. It can achieve maximum access to renewable distributed energy; can be compatible with the large power grid as a supplementary unit to participate in the operation; according to the development needs to allow more small modular device access, easy to expand the scale.

Flexible. It can be used as a single control unit to achieve "plug and play"; and will provide different levels of power quality according to the user's demand for flexible pricing.

Economical. It can comprehensively optimize the utilization of energy, operational efficiency and environmental emissions, and unified management of market transactions and asset allocation.

An Important Part of Smart Grid

Firstly, the most important feature of smart grid is self healing. No matter what kind of accident happens, it can be solved by itself, to ensure the safety of the power system. Similarly, the microgrid is a small power supply system, integrating distributed power, load, energy storage and protection and control of a series of links. It's biggest feature is able to run autonomous, which is similar to the smart grid self-healing.

Secondly, smart grid encourage users to participate in the grid to interact, which is good to

realizing the rational allocation of resources. As an independent power supply network, microgrid also needs to be dynamically adjusted according to the user's information to achieve balance between supply and demand.

Thirdly, smart grid has a full range of security decisions, ensuring it is capable of physical and cyber attacks. Similarly, the microgrid can not only act as a standby power supply by the end of the network to provide effective support, but also improve the entire power grid after the resilience and disaster emergency response capability when suffering from extreme disaster conditions.

Furthermore, the compatibility of smart grid allows the access of different types of power generation and energy storage systems. The microgrid itself is a collection of distributed power and distributed energy storage, it is based on this condition that the micro network is able to achieve internal energy storage and conversion system.

Last but not the least, Smart grid can provide power quality meeting the needs of users in the future, and one of the conditions of the microgrid is close to the load center, and carry on the classification of load. Microgrid can achieve personalized power supply for different levels of load, that is being able to provide quality and reliable power service to important users.

Conclusions

As an important part of smart grid, micro grid plays an important role in power grid support, earthquake prevention and disaster reduction, energy efficiency, energy saving, rural electrification, and so on. By fusing advanced information technology, control technology and power technology integration, microgrid can not only to provide a higher power reliability and meet the diverse needs of different users, but can also achieve energy efficiency, economic efficiency and environmental benefits of the maximum. It is a new form of intelligent distribution network in the future.

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