

Application of Green Power Generation Technology for Distributed Energy

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Abstract. This article discusses and analyzes the technical strengths and weaknesses of the green power generation that can be used for distributed system (power generation) power generation, for instance, solar power generation, wind power, hydrogen fuel cells, biomass power generation, and small gas turbines. The key to the discussion is to apply the technical distributed power generation of solar power stations. In addition, it also discussed the use of "focusing solar power generation high-temperature solar thermal power conversion system software" technical completion of distributed system power distribution. Low-cost, high-temperature solar thermal power generation is selected as the power generation solution medium, the power generation is technically low consumption and high-efficiency, the volume and power generation methods are conveniently equipped, the stability is high, and the economic development is environmentally friendly.

1 Introduction

Distributed Generation (DG) or Distributed Resource (DR) is generally defined as the composition of small and medium-sized diesel generators or distributed power sources and energy storage technology, which are connected around the customer side to meet some end-user customers' requirements[1]. Their storage capacity is generally small, ranging from tens of kilowatts to hundreds of thousands of kilowatts. Common forms of Distributed Generation include some environmentally friendly new energy, such as gas, hydrogen power, solar power and wind power. Distributed Resource can use a variety of new energy technologies. Generally speaking, the Distributed Resource system is a way of immediately connected to the 380 V or 10 kV distribution network system for grid connected operation or free operation. In addition, We can sort the DR into the following categories [2,3].

Power generation system software that takes this kind of technology as the key technology, such as gas turbines, natural gas vehicle engines or gas turbine reciprocating vehicle engines, small turbine engines, etc.

Hydrogen fuel cell power generation system software includes ammonium hydrogen sulfate fuel cell (PAFC), proton exchange membrane hydrogen fuel cell (PEMFC) [4], molten rock carbonate hydrogen fuel cell (MCFC) and solid metal oxide hydrogen fuel cell (SOFC) .

Photovoltaic battery power generation system software

Wind turbine system software [5]

Bio-energy power generation system software [6,7]

1.1 Socioeconomics

Compared with traditional large and medium-sized thermal power plants, the Distributed Resource power generation system software has the advantages of less project investment, less risk, smaller floor space, and shorter capital construction cycle time. The DR power generation system software is built around the load core, and there is no need to build expensive transmission and distribution Internet and power distribution stations. It saves land resources, and the load is consumed locally, which greatly reduces the line construction cost and line loss of long-distance power transmission.

1.2 Ecological environment protection

Using gas or hydrogen, solar power and wind power, due to reduce fuel use or no need for fuel, can reduce the emission of harmful substances, thereby alleviating the working pressure of natural recovery of the environment. Many nearby principles can reduce the basic construction of large-space, long-distance, and high-voltage transmission lines. It not only reduces the electromagnetic radiation generated by the high-voltage transmission line, but also reduces the land resources and route aisle of the high-voltage transmission line. And It can also reduce the broadscale cutting down of trees, which is beneficial to ecological environment protection.

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1.3 The diversification of the main uses of electric energy

Distributed Resource can use various alternative electric energy sources, for example, green resources (gas), new resources (hydrogen) and renewable resources (wind and solar power). In the meantime, the process of converting fuel energy into electric energy, power generation system will produce a lot of heat energy, which is usually abandoned by traditional power plants. Distributed Generation can play a dual role of power supply and heating in residential or commercial areas by establishing cogeneration devices, improve fuel utilization efficiency and reduce pollution. Therefore, this is also a new method to deal with energy shortage issues.

1.4 Reliable switching power supply

DR is transformed into system software separately from each other. In the event of a problem in the power grid, DR can ensure the energy supply of its customers and prevent some devastating adverse effects. Meanwhile, a lot of Distributed Resource power generation system software is included in the power grid and can be maintained when Distributed Resource cannot operate normally because of its own matters. Thus, the Distributed Resource power generation system software built around us and connected to the large power grid can further improve the overall energy supply, especially the operational safety and stability of the power supply system.

1.5 Solutions for power distribution in remote areas

It is very difficult to distribute power from the power grid in remote areas and areas with sudden load growth. Therefore, the use of separate system software for solar, wind, and bio-energy power plants may be the best approach to avoid a large amount of capacity expansion cost of transmission and distribution equipment.

2 Categories and characteristics of the power generation function of Distributed Resource power generation systems

2.1 Small turbocharged power generation system software

The output power of each small turbine engine ranges from 0.2 to 500 kW even can be expanded to 1 MW. Its main technical principle are using radial flow centrifugal impeller automobile engine (centrifugal turbocharger and multi-stage centrifugal fan) and heat recovery cycle. The key to small turbocharged diesel generators is fuel gas, methane gas, automotive gasoline and diesel engines. It has the advantages of high stability, long service time, low noise, light weight, small output capacity, clean energy, rich materials, and low consumption. This is also the most widely used of Distributed Resource system[8].

2.2 Wind turbine system software

Among all kinds of energy, wind energy is relatively simple to use. It is different from coal, oil and natural gas. It needs to be excavated and transported to the boiler equipment of thermal power plant for combustion; It is also different from hydraulic energy. A dam must be built to drive the water turbine; Nor does it require expensive devices and protective equipment like atomic energy. The utilization of wind energy has a broad future because of its simplicity and convenient installation. Especially in coastal islands, mountainous areas and plateau areas where there is a lack of hydraulic resources, fuel and inconvenient transportation, there is high-speed wind, which is a very valuable energy. If it can be used to generate electricity, it will be quite beneficial to the life and production of local people

2.3 System software of solar power station

Solar energy is the most smart and practical technology of all renewable energy sources. The technical nature of solar power generation includes solar thermal power generation [9] and solar cell power generation[10]. Solar thermal power generation technology is an important project of solar energy utilization. It gathers solar energy, heats working medium and drives steam turbine to generate electricity. The optimal capacity range for general applications is one. At present, solar thermal power generation can be roughly divided into three categories: solar focusing power generation, solar pool power generation and solar chimney power generation. According to the form of receiving system, solar focusing power generation can be divided into three types: slot line focusing system, tower system and disc system. Solar cell power generation technology directly converts light energy into electric energy, and generates DC electric energy according to the photovoltaic effect of solar cell semiconductor materials. A solar cell usually has an area of less than one square centimeter, can only produce a voltage of about 0.5V, and the output power is very limited, usually less than 1W. Therefore, in order to output more power, according to the actual demand, many cells can be assembled into solar cell modules, and can also be connected in series or in parallel.

The characteristics of solar power generation are: inexhaustible resources, no air pollution, not subject to regional restrictions, and very convenient. Photovoltaic cells can be used as a separate power supply system, and can also be connected to the power grid. However, if the solar power station system software is successfully applied to the DR system software, some problems must be dealt with. Such problems include: how to further control the cost, how to solve the problem of low solar light than energy, how to solve the change of radiant power within 24 hours, and how to solve the problem of power engineering stability. In the new approach clearly presented below, most of these issues have been dealt with.

2.4 Hydrogen fuel cell power generation system software

Hydrogen fuel cell [11] immediately uses radon gas obtained from various fuels (gas, gas and crude oil), reacts with O₂ in the air with the help of electrolyte solution, and produces water together with electricity. For the most part, it converts mechanical energy into electromagnetic energy. It immediately converts the mechanical energy into electromagnetic energy, instead of the traditional thermal power plant system software, which converts the mechanical energy of the fuel into heat and then into mechanical kinetic energy, so it is simple and efficient. The chemical energy is then converted into electromagnetic energy. Because there are too many conversion processes, the overall power generation is high and the efficiency is not high.

The hydrogen fuel cell has the advantages of high heat transfer efficiency, zero emission, no noise, no vibration, application of water saving, stable and reliable driving force output, and strong ability to solve load changes. However, if hydrogen fuel cells are widely used in the DR power generation system software, the problem of increased project investment costs can be dealt with. The installation cost of hydrogen fuel cell is 3000-4000 USD per KW. Therefore, more efficient new technologies must be used to improve the level of manufacturing, expand the scale of production, and then improve the level of automation technology..

3 Use the new "Focus Solar Power High Temperature Photothermal Power Conversion System Software" to complete DR power distribution

3.1 Technicality of solar power station

Solar power is inexhaustible, and it is not easy to cause environmental pollution. It is the optimal power source for large-scale public applications. Therefore, scientific researchers have been exploring ways to use the sun. So far, this technology has only been used to produce ultra-low temperature and low-taste electric energy, such as boiling water. Aiming at high temperature and high quality electric energy, especially electric energy production and manufacturing, Because the technological development is relatively limited, the product cost is high. In addition, the technology cannot be compared with traditional fossil fuels. There are several solar power generation technologies, the following part will briefly introduce their realization in detail.

3.1.1 The technicality of solar power generation..

This technology has already experienced a development trend for more than a century. So far, there have not been all important improvements. This technology still uses semiconductor materials for photoelectric conversion, such as photovoltaic cells and crystalline silicon. The cost of large-scale power generation is much higher than that of non-renewable resources. It is not possible to meet the needs of large-scale power generation in today's economic

situation. Therefore, the process seems to have difficulties in replacing or filling the traditional power engineering manufacturing level [12]..

3.1.2 The technical nature of solar thermal power generation.

This technology has been used on a large scale. Its crucial issue is tracking manipulation. Because of the diversification and precision requirements of its tracking, it is impossible to reasonably reduce the cost of the lighting module. At the same time, because the conversion of CSP is generated in the open indoor space, there are many damages caused by light reflection and thermal damage. CSP has high conversion efficiency and low efficiency, and its rationality is far less than traditional (electric energy production and manufacturing) methods..

3.2 Focusing solar power high temperature CSP conversion system software

High-temperature CSP materials can be produced at low cost to generate electricity [14]..

3.2.1 Key criteria.

The sun can be focused based on the reflective surfaces on the three sides. The concentrated sun reaches the juxtaposed mirror area of the glare focus point and can be concentrated on the bathroom mirror. There is a small round hole on the focal point of the dazzling mirror on the heat storage safety channel. The focusing lamp can go into the hole to complete the conversion of photothermal power generation. According to the basic principles of heat [15], this method is similar to the heat conduction standard in boldface, which can complete the conversion of high-efficiency CSP. Fuqing in the safe passage is used as a material for heat conduction and heat storage. Its technical basic principles have been recognized in the operation process equipment, and the tracking control system has been grasped to achieve high-precision and reasonable regulations. The Fuqing substance can be heated to above 800°C after passing through the reflective surface three times. It can be connected to the current motor to meet the requirement of becoming larger. Figure 1 shows the photos of the proposed machinery and equipment.



Figure 1. The high-temperature solar thermal power conversion system software is completed according to the focus solar power generation

3.2.2 Technical characteristics.

The heat storage capacity is not restricted, and the construction is convenient and flexible. The system software can be easily connected to generators of various capacities according to different methods. It can be used together with steam turbine or gas turbine power generation. Its geometric figure is relatively low in height, which is convenient for shock resistance. Each module has the same posture, so it is easy to operate. It has high stability and low cost. There are no special or bureaucratic regulations to implement this technology, and at the same time it does not require a lot of electrical equipment. Even if processing machinery and equipment are used, the facility can be completed at low cost.

There is a certain degree of thermal radiation damage when focusing on the three reflective surfaces, so the kinetic energy transmission, transformation and utilization rate are high.

All components can be mass-produced, thoroughly meeting the necessity of mass application.

The middle heat transfer medium (salt) can be heat treated to a temperature above the change. High-temperature storage can be completed at the same time, and high-end heat can be given at the same time. The annual operating time of generator equipment has been greatly improved. The heat exchanger standard in the heat storage safety channel is stable, and the super large total area in the heat storage safety channel can ensure the timely and flexible adjustment of the motor load. This will further help improve the comprehensive rationality of generator equipment.

3.2.3 Estimated development trend.

At this stage, the investment per KW of the system software and the cost of wind power are very high. However, its power generation capacity is much higher than wind power generation. At the same time, the selectivity of engineering construction sites is far better than wind power generation. Therefore, its rationality is better than wind and solar power generation. With the further improvement of the production process, the cost can be the same as the basic coal chemical industry.

The results obtained at this stage indicate a good vision for the direction of development. Nowadays, there are a variety of gas turbine machines and equipment with different volumes on the sales market. They have given the flexibility to select special KW-manufactured small turbine engines and the established system software according to the application. In addition, the entire process of scientific research and development will be completed without project investment exceeding 10 million US dollars. After all the development and design of the model enterprise are carried out, the method will be comprehensively improved, and the electric energy production process will be more cleaned up.

4 Conclusion

Distributed power generation (DPG) technology is a new technology. It can develop along with the rapid development of renewable resources technology. Because of the concept of natural environment, DR technology must be more and more critical for analysis. The reform and innovation of the power system will promote the development trend of distributed power technology. In the current stage of work, "Focus Solar high-temperature solar thermal power conversion system software" is discussed as an uncertain distributed system resource (DR) technology. The high-temperature photo thermal power generation material for generating electricity can be produced at low cost. It has the advantages of low cost, high conversion efficiency, volume distribution, flexible and reliable power generation methods, economic development, and environmental protection. This technology is a new type of emerald green power generation technology. Through further improvement of soundness, it is hoped that a new direction will be clarified for the development trend of green energy..

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