China's photovoltaic power generation technology and application

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Abstract. In recent years, with the continuous development of the concept of environmental protection economy and sustainable development, the development of new energy has been widely recognized, and the development of new energy has become a very important measure for the current filling of the energy industry. Solar photovoltaic power generation plays a very important role in the development of new energy. This article mainly describes the advantages of solar photovoltaic power generation technology, explains solar photovoltaic power generation system, explains the principle of solar photovoltaic power generation technology, discusses the advantages of solar photovoltaic power generation and insufficient, and show the current development and application status of solar photovoltaic power generation.

1. Introduction
As the consumption of non-renewable resources grows larger, it will eventually be exhausted one day. Solar photovoltaic power generation technology, relying on the use of solar energy resources, is inexhaustible. The environmental pollution of solar photovoltaic power generation is much smaller than that of traditional non-renewable resources. Therefore, solar photovoltaic power generation technology has been paid attention to by various countries in the world and is widely used.

2. The principle of solar photovoltaic technology
When the sun shines on the semiconductor pn junction, a new hole-electron pair is formed. Under the action of the pn junction electric field, electrons flow from the p region to the n region, and the holes flow from the n region to the p region. Current. This is the working principle of photovoltaic effect solar cells [1].

There are two ways of solar power generation, one is light-thermal-electric conversion, and the other is direct-to-electric conversion.

3. Solar photovoltaic power generation system
Photovoltaic power generation systems are divided into independent photovoltaic power generation systems, grid-connected photovoltaic power generation systems and distributed photovoltaic power generation systems [2].
4. Advantages and disadvantages of solar photovoltaic power generation technology

4.1. Advantages of solar photovoltaic technology
From the perspective of the world, conventional energy sources are very limited. Solar energy is an inexhaustible source of renewable energy. It is absolutely safe, clean, extensive, economical, and maintenance-free. Occupy a very important position [3].

Compared with the traditional thermal power generation system, the advantages of solar photovoltaic power generation technology can be summarized as follows: (1) no danger of exhaustion;(2) absolutely safe and reliable, no noise, clean; (3) no geographical restrictions, in areas without electricity and Complex terrain can also be used; (4) short time to obtain solar energy; (5) high energy quality; (6) people are more acceptable; (7) can generate electricity without fuel consumption and construction of transmission lines [4].

4.2. Insufficient solar photovoltaic power generation technology
Although solar photovoltaic power generation technology has many advantages, the production of solar panels has the characteristics of high energy consumption and high pollution. According to relevant statistics, the production of a 1m×1.5m solar panel must burn more than 40 kilograms of coal, even the most inefficient. Thermal power plants can also use this coal to produce 130 kWh of electricity – enough for a 2.2 watt light-emitting diode (LED) bulb to shine for 30 years on a 12-hour day.

The shortcomings of photovoltaic power generation are mainly reflected in:(1) photovoltaic panel manufacturing is not environmentally friendly;(2) the energy obtained is related to meteorological conditions such as four seasons, day and night, and cloudy weather. The use of solar power to generate electricity requires high equipment costs and low solar energy utilization rate. Widely used, mainly used in some special environments, such as satellites.(3) The energy density is small and requires a large area.(4) Compared with thermal power generation, the cost of power generation is high [5].

5. Development and application status of photovoltaic power generation technology
Nowadays, with the increasing attention of the photovoltaic industry, the photovoltaic power generation industry has entered a stage of rapid development. In terms of technological innovation, there have been great breakthroughs, coupled with the support of some strong policies of the country, and many the planned operation of the project has been widely used, which has greatly improved the development speed of photovoltaic power generation technology.

5.1. BIPV application
BIPV is Building Integrated Photovoltaic, which refers to the integration of photovoltaic buildings. The concept of “photovoltaic power generation and building integration” was first officially proposed in 1991, and became a hot topic in a short period of time. BIPV is a research hotspot of large-scale utilization of photovoltaic power generation in the world [6]. There are two main forms of integration between photovoltaics and buildings: one is to integrate photovoltaic devices with buildings, to install photovoltaic panels to the roof, to replace ordinary glass curtain walls with photovoltaic glass walls, and for photovoltaic devices on roofs and walls. Absorbing solar energy, so that building materials can be used to generate electricity, thereby reducing the cost of photovoltaic power generation. The other is to install the flat-panel photovoltaic device on the roof of the building, and the photovoltaic array supplies power to the user in parallel with the grid to form a user-connected photovoltaic system. The essence of the solar roof is to install solar cells on the roof of the building, make them a whole, and connect the terminals to the public grid through the controller and inverter. The solar panels are the main functional hardware, and the grids are connected in parallel. After that, the electricity is transmitted to each household, and the user's grid-connected photovoltaic system is formed.

Photovoltaic building integration combines photovoltaic power generation with buildings, and utilizes the idle location of the building roof to assemble solar photovoltaic power generation modules to meet power demand. This model can also be combined with the curtain wall of the building to obtain...
more idle locations for the installation of solar photovoltaic cells to get more sunlight and convert more electricity. There are many advantages to photovoltaic building integration: (1) clean energy, energy saving and environmental pollution reduction. Solar photovoltaic power generation mainly relies on absorbing sunlight to generate electricity. In the past, power generation technology did not rely on burning coal resources or hydropower. Therefore, solar photovoltaic power generation technology is a clean and pollution-free technology. (2) In the event of an earthquake disaster, solar photovoltaic power generation can meet the needs of the building and will not be powered off due to the interruption of the urban power grid. At present, huge color photovoltaic modules have been developed to replace expensive wall exterior materials, which will not only achieve the above purposes, but also make the building look more attractive [7].

5.2. Photovoltaic shading
A further goal of photovoltaic building integration is to integrate photovoltaic devices with building materials. For example, the roof of a building, the material of a window, and the outer wall of a sunny side are all placed into photovoltaic devices, which can be used not only as building materials but also for power generation. After all, photovoltaic devices are used as building materials, so they should have higher requirements. They should be waterproof and damp-proof like building materials, maintain temperature to isolate heat, and should achieve certain compressive and shear strength. Performance related to electrical insulation, etc. In terms of construction, it is necessary to be safe first. During construction, it is easy to operate and implement. After the installation is completed, it should also meet the other necessary requirements such as the beautiful appearance of the external wall surface. In short, by replacing some building materials with photovoltaic devices, the cost of photovoltaic power generation can be more controlled, which is more conducive to people's recognition of photovoltaic technology.

5.3. Applications in communications and industry
At present, due to the scattered and economical use of the communication field and the industrial field, solar photovoltaic power generation technology is widely used in the communication field and the industrial field. Applications include force communication systems, microwave relay stations, satellite communications and satellite television receiving systems, rural program-controlled telephone systems, fiber-optic cable systems, railway and highway signal systems, hydrological observing systems, meteorological and seismic stations, lighthouses and beacon lights. Cathodic protection of oil pipelines and cathodic protection of water gates [8]. These applications have greatly promoted the development of communications and industry.

5.4. Large-scale photovoltaic power station
The most abundant places for solar energy are wasteland, desert, and Gobi. These areas are dry and rain-free and have vast areas. The land cannot be cultivated, so no economic crops can grow in these areas. After research and investigation, the scientists found that the solar resources in these places are quite sufficient, so it is a very correct and sensible decision to establish a photovoltaic power station in the desert. In order to avoid waste of resources, many companies have established large-scale power stations in these areas to invest in solar photovoltaic power generation. The construction of power stations not only solves the problem of insufficient power supply in some areas, but also provides economic development opportunities and employment opportunities for the development of desert areas [9].

5.5. Solar photovoltaic agricultural science and technology greenhouses in rural areas
Photovoltaic agricultural science and technology greenhouse is a new type of photovoltaic system project that combines with agricultural production, solar power generation on the roof, and agricultural production in the shed. It is a new model for the development of modern agriculture. It realizes clean energy power generation through the construction of shed photovoltaic power project, and finally merges into the national power grid. At the same time, it combines photovoltaic technology with modern
physical agriculture development under the shed, develops modern physics and efficient agriculture, explores a safe and efficient new model of crop production, and effectively uses it. Limited resources and space to improve the economic benefits of unit land. The roofs of the greenhouses are all polycrystalline silicon single-glass solar modules and monocrystalline silicon double-glass solar modules. These solar modules can work normally as long as there is light. When the light is sufficient, the electricity generated is fully integrated into the power grid. Since the solar power panels on the roof of the greenhouse are not completely covered, the light under the shed is also sufficient, which is suitable for the growth of crops. The main body of the greenhouse is a steel skeleton. The interior uses three-dimensional planting, soilless cultivation and other agricultural high-tech means to develop and plant blueberries, industrial production of edible fungi, green tea and black tea planting, and research and cultivation of vegetables and high-end seedling flowers [10].

In recent years, due to the continuous expansion of new rural areas and the rapid development of the rural economy, especially for village-level poverty alleviation power stations, the demand for electricity is increasing. However, due to the imperfect development of rural transportation and technology, the supply of electric energy resources is far from keeping pace with the development of rural areas.

5.6. Solar energy application on commodities

With the continuous development and maturity of solar power generation technology, its application range is more and more extensive, especially the application of commodities, which greatly improves the economic benefits of solar power generation and provides a continuous source of power for the further development of solar power generation technology. At present, the most common solar products include solar street lights, solar garden lights, solar lawn lights, solar fountains, solar city landscapes, solar signal signs, solar advertising light boxes, solar electric cars, solar yachts, solar clocks, solar caps, solar watches, solar toys, etc. [11]. These goods are daily necessities for daily use, and the use of solar energy greatly enhances their economic benefits.

6. Conclusion

In general, solar photovoltaic power generation technology is developing rapidly. This technology is widely used and has a very good development prospect. However, it still has some shortcomings. There are some shortcomings in technology development and use, solar power generation materials, etc. and the development of the whole industry chain is not mature. In order to use the perfect solar photovoltaic power generation technology as soon as possible, we should learn lessons, change the energy structure that relies too much on fossil energy, actively develop renewable energy, realize the harmonious development of human beings and nature in a true sense, and find reasonable ones in time. The countermeasures have made solar power generation, as an inexhaustible and inexhaustible clean and environmentally friendly energy source, better developed in the 21st century, applying solar photovoltaic power generation technology to the construction of the people's good life and alleviating human development. The situation of energy shortage in the process ensures the sustainable and healthy development of the economy, promotes the continuous expansion and application of new energy technologies, and effectively improves the ecological environment and solves the problem of the global greenhouse effect.

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