

# Brief Discussion on the Development of New Energy Power Generation

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## Abstract

In recent years, with the continuous development of economy, China has become the second energy consumer in the world. With the emergence of the questions around the environment, the development of green ideas goes deep into the hearts of the people. Vigorously developing green and new energy and actively promoting the development of new energy has become a common understanding of the society. In order to develop and utilize new energy on a larger scale, China has made great efforts to change the power generation of new energy in China. This article revolves around the main problem of the development of new energy source science, studies the present situation of the development of new energy power generation in China, analyzes the prospect of the development of new energy source in our country, and concludes the problems that need to be solved in the scientific development of new energy source in our country. Put forward the related measures and suggestions.

## Keywords

New energy power generation; solar photovoltaic generation; wind power generation; hydropower generations.

## 1. Background of New Energy Power Generation

As far as the reserves of energy are concerned, the reserves of traditional natural gas resources and coal resources in China are very considerable, and the resources of hydropower, wind and solar energy are also very rich, which can provide a great prospect for the development of new energy. However, because of the large population of our country, the per capita share of resources is not dominant. For example, China's per capita share of coal resources is only 70% of the world's average population. In addition, the extensive mode of economic growth in the early stage of China's development has caused great pressure on the environment. Changing the mode of economic growth and promoting the adjustment of economic structure have become the inevitable choice for China's economic development in the new period. In this context, the concept of green development has been widely accepted, which has become an inevitable requirement to solve the constraints of resources and environment, deal with climate change and change the mode of economic development.

New energy power generation emerges as the times require: corresponding to the traditional conventional energy such as coal, oil, natural gas and so on, new energy refers to renewable energy such as solar energy, biomass energy, wind energy, nuclear energy, geothermal energy, tidal energy and hydrogen energy. New energy power generation is the use of the above renewable energy to achieve power generation process. It is of great significance to increase the proportion of new energy power generation, promote the development of new energy power generation technology and enhance the level of green development in China.

## 2. Solar Photovoltaic Generation

Photovoltaic effect is the basic principle of solar power generation, and solar cell is the carrier of solar energy to electric energy conversion. Solar cell is a semiconductor material containing P-N junction. When solar light shines on the semiconductor P-N junction, a new electron-hole pair is formed. Under the action of the electric field of the P-N junction, the hole flows from the N-zone to the P-zone, and the electron flows from the P-zone to the N-zone, and the current is formed after the circuit is switched on. That's how the photoelectric effect solar cells work.

When many batteries are connected in series or in parallel, they can be used as solar arrays with relatively large output power. Solar cell is a promising new power supply with three advantages: permanence, cleanness and flexibility. Solar cell has a long life. As long as the sun exists, solar cell can be used for a long time. Compared with thermal power generation, solar cells do not cause environmental pollution.

China's photovoltaic industry started late, but showed a momentum of rapid development. In 2002, China's photovoltaic industry began to start. After 2010, China's PV industry rose rapidly in the background of Europe's PV industry slowdown, becoming the main driving force of the global PV industry development. In 2019, China's new photovoltaic grid-connected capacity reached 30.1Gw, a year-on-year decrease of 32.0%; By the end of 2019, the accumulative installed capacity of photovoltaic grid-connected reached 204.3Gw, an increase of 17.1% year on year; Annual photovoltaic power generation capacity of 224.26 billion kwh, an increase of 26.3%, accounting for 3.1% of China's total annual power generation, an increase of 0.5 percentage points. The new and accumulated installed capacity of PV continues to be the first in the world, of which the new installed capacity of PV has been the first in the world for 7 consecutive years.

### 2.1. Solar Photovoltaic Power Applications

Because the independent photovoltaic power generation system has a wide coverage, low application difficulty, and will not bring interference to the power grid, the control method is relatively simple, so the independent photovoltaic power generation system is often used in mountain village, field, island and other places where the power grid can not be covered.

From the point of view of grid-connected photovoltaic distribution structure, the grid-connected photovoltaic power generation system in China is mainly large-scale centralized photovoltaic power generation system, which is characterized by large installation scale, small construction difficulty and short development cycle. In the face of large-scale photovoltaic rapid development, grid-connected access difficulty and high abandonment rate, China vigorously encourages distributed photovoltaic construction, which can effectively solve the problem of occupying a large amount of land in the development of photovoltaic power stations. It can also make effective use of construction resources.

The integrated technology of photovoltaic building, that is, installing solar thin film power generation equipment in the process of building construction, and sending a large number of thin film power generation connections to the power grid, through photovoltaic building power generation, can not only provide power supply for users in urban parks and buildings, but also reverse sell excess power generation to the power grid, reduce power loss and increase revenue. [1].

## 3. Wind Power Generation

The kinetic energy of the wind into mechanical kinetic energy, mechanical energy into electrical kinetic energy, which is wind power generation. The principle of wind power generation is to use wind power to drive the windmill blade rotation, and then through the speed increase machine will rotate speed, to promote the generator power generation. Depending on the

windmill technology, a breeze speed of about three meters per second (the degree of the breeze) can start generating electricity. Wind power is becoming a worldwide craze because it requires no fuel and produces no radiation or air pollution.

China's vast territory, land border total length of more than 20000km, total coastline length of more than 18000 km, according to the State Meteorological Department of the relevant research data show, In China, wind energy resources are abundant, of which the amount of wind energy available for onshore wind power generation is more than 260GW, and the available ocean wind energy resources are more than three times higher than the land part. Throughout the western and northwestern regions of China, there are unlimited wind energy resources. According to statistics, China's current average annual wind speed in more than 6m / s area of 1.2% of the total land area, second only to the United States, Russia, ranked third in the world.

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### **3.1. Wind Power Generation Applications**

#### **3.1.1. Intelligent Wind Power Production Forecast Management Technology**

As a kind of distributed energy, wind power needs to do enough work in production management. It mainly focuses on how to improve the efficiency of wind energy conversion, and puts forward a reasonable management technology strategy, so as to increase the profitability of wind power enterprises. In order to effectively promote the effective development of wind power industry, some areas have fully implemented intelligent wind power production prediction management system, through this technology to predict and intelligent management of wind power production process. First of all, the intelligent wind power production prediction technology in the system is used to predict the weather conditions, and the time series method is used to reasonably predict and plan the output power of wind power generation, so as to continuously increase the reliability of wind power generation. Secondly, the intelligent management technology is applied to strengthen the research and development and practical application of rectifier based on power electronic devices. In addition, the low voltage traversing technology is also used, the main characteristic of this technology is to ensure that the wind power generator can continue to run above 600ms when the voltage falls. If the voltage drop index exceeds 20%, the wind power generator will turn to the off-grid operation state, that is, the low voltage crossing technology can provide reactive power technical support for the power grid, and effectively improve the safety and reliability of the power supply technology of the power grid.

#### **3.1.2. Large Onshore Fan Control Management Technology**

Pneumatic design concept is used in the technical system of large-scale onshore fan control management, It is rich in control strategy and in place, can fully combine the wind turbine and wind power production process, maximize the highland wind power production technology advantages, to achieve safe and stable management of wind power production. These control measures pursue the connotation of fine management, and can direct the fan to achieve efficient and safe production operation process. Large-scale onshore wind turbine production

management has been recognized in China, but its production management technology is still in the development stage of trial and development. According to the current situation of domestic wind power market, Shanghai Electric has developed and designed a new 2.0Mw large-scale onshore wind turbines by Aero-dyn Co., Ltd. It is currently the world's largest capacity onshore wind turbine, the wind turbine joint development and production management applications also strengthened our independent research and development of wind turbines, independent development of wind power production determination.

### **3.1.3. Wind Turbine Power Generation System Management Technology**

Wind turbine power generation system is a common wind power production management system in China. At present, the new wind turbine power generation system is rich in the application of management technology. It is mainly based on the variable pitch regulation and the traditional fixed pitch stall regulation. If the wind speed is low, the wind turbine power can be adjusted mainly through its pitch control to improve the pneumatic production efficiency of the wind turbine. If the power of the wind turbine reaches the rated power, the main use of pitch stall control to ensure that the pitch angle has been turned in the direction of the small wind force. If the wind turbine power reaches the rated power, the main use of pitch stall control to ensure that the pitch angle has been turned in the direction of, The angle of attack is observed to increase at a certain angle, so as to deepen the stalling ability of the impeller blade, effectively control the wind energy collecting water level of the wind turbine, and realize the stable power generation of the wind turbine.

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## **4. Hydroelectric Power**

Based on the natural condition of the water level drop, the scientists make good use of flow engineering and mechanical physics to achieve the highest power output for people to use cheap and pollution-free electricity. And low water by absorbing the sun for water circulation throughout the earth, thereby restoring high water sources. Today, hydropower ranges from a few tens of watts in rural Third World countries to millions of watts in big cities.

### **4.1. The Status of Hydropower Generations**

#### **4.1.1. Sustainable Development of Hydropower**

China has a vast territory, the distribution of water resources is very uneven, and the conditions for the development of water resources are different. "Water conservancy" generally covers flood control, water supply, irrigation, shipping and power generation, and so on. Water conservancy and hydropower are related to water conservancy industry, power industry, energy, hydrogeology and other departments. The development of water conservancy and hydropower can not be separated from all kinds of energy components in the local power grid. The general power grid is composed of hydropower and thermal power. Hydropower has good

peak-shaving performance and can improve the transmission quality of the power grid. However, when the hydropower resources in this area are developed, hydropower and thermal power can not grow synchronously. When the proportion of hydropower is low, the peak-adjustable electric energy in the power grid will be reduced. However, underestimation will lead to the increase of current cycle and voltage, which greatly affects the quality of transmission.

Because of the growth of national economy and the improvement of living quality, a power grid will tend to decrease its capacity with the passage of time. When hydropower development is limited by water resources and hydro-energy resources, a large number of new energy sources such as wind, solar, nuclear will arise, which will inevitably lead to the reduction of hydropower peaking power in the power grid. The development of water conservancy and hydropower is restricted by water resources and hydro energy resources, while the development of thermal power is restricted by the discharge of ore resources and harmful gases. However, most of the renewable energy is unstable and intermittent, which can be seen that the development of one of them can not meet the requirements of people's living standards. Renewable new energy and hydro-thermal power are inseparable from the development of other resources and industries to support each other, if they can be coordinated development, they can achieve the goal of common progress.

#### **4.1.2. Benefits of Hydroelectricity**

Compared with thermal power, hydroelectric power has the following advantages: First, in the profit of power generation, The unit selling profit and unit generating cost of thermal power are about 1 / 8 and 5.65 times of that of hydropower. Hydropower can create more than half of the profit for the grid with about 15% of the power generation. Thermal power is a kind of non-renewable energy, which uses coal. At the same time, compared with thermal power, hydropower has a great advantage in environmental friendliness. Hydroelectric power is superior to solar and nuclear power. As far as photovoltaic power generation is concerned, at this stage, the price of photoelectricity is relatively high, and the efficiency of photoelectricity conversion is relatively low and the influence of natural weather is relatively large, etc. For nuclear power, there is the limited nature of raw materials, nuclear power in the process of operation there is a risk of nuclear leakage, there is a serious lack of security risks and the current lack of adequate human resources related aspects. So from the cost of power generation, economic benefits, security, related technologies and other aspects of hydropower development prospects better.

#### **4.1.3. Prospects for Hydroelectricity**

Wind-water power generation is a kind of power generation technology that conforms to the current situation of our country and meets the needs of the development of environmental protection and energy-saving society in China. It has prominent advantages in economic and social benefits. Compared with thermal power, wind power, photovoltaic and nuclear power, hydropower has obvious advantages in economy, safety and technology maturity, so it is worth popularizing[3].

## **5. Conclusions and Prospects**

In order to develop new energy scientifically and promote new energy generation, we should adhere to the principle of combining centralized development with decentralized development, land and sea development, comprehensively consider the factors such as capital source, demand, cancellation, system operation and cost, coordinate energy production and transportation, and optimize the layout of new energy. For example, we will speed up the development of local decentralized wind power, offshore wind power and distributed photovoltaic power generation in the central and eastern regions, steadily promote the

construction of scenic power bases in the "three north" regions, promote nuclear power generation throughout the country, and encourage new energy and power to be reduced as a matter of priority.

A series of environmental problems caused by the development and utilization of coal resources and natural gas resources and the limited reserves of resources determine that the large-scale development and utilization of new energy is a necessary means to ensure national energy security and ecological health. Because of the great potential of new energy development in our country, the policy mechanism and the development of science and technology will provide strong support for the development of new energy. It can be predicted that new energy will gradually develop into the main power source of our country.

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