

UDC 621.3

## PRESENT SITUATION AND DEVELOPMENT OF PHOTOVOLTAIC POWER GENERATION

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*Due to the global energy and environmental problems, photovoltaic power generation and other new energy generation types have been vigorously developed. This paper analyzes the current situation and development trends of photovoltaic power generation, and prospects for the future development.*

### a. Significance of photovoltaic power generation

In order to cope with the global energy crisis and increasingly serious environmental problems, countries all over the world are trying to explore the path of green and sustainable development of energy. The formal signing of the Paris Agreement in April 2016 demonstrates the urgency of action on environmental issues and the determination of countries to address them. Solar energy, as the representative of renewable energy has been vigorously developed. Solar energy, as an important renewable energy source, mainly includes photovoltaic and photothermal applications.

### b. Current situation of photovoltaic power generation

Since 2011, with China, Japan and the United States as the lead, countries all over the world have strengthened their layout in the field of photovoltaics, and the photovoltaic market has developed rapidly. According to the International Renewable Energy Agency (IRENA), global installed capacity grew steadily between 2011 and 2020, reaching 702,909 MW in 2020, an increase of 20.32% year-on-year.

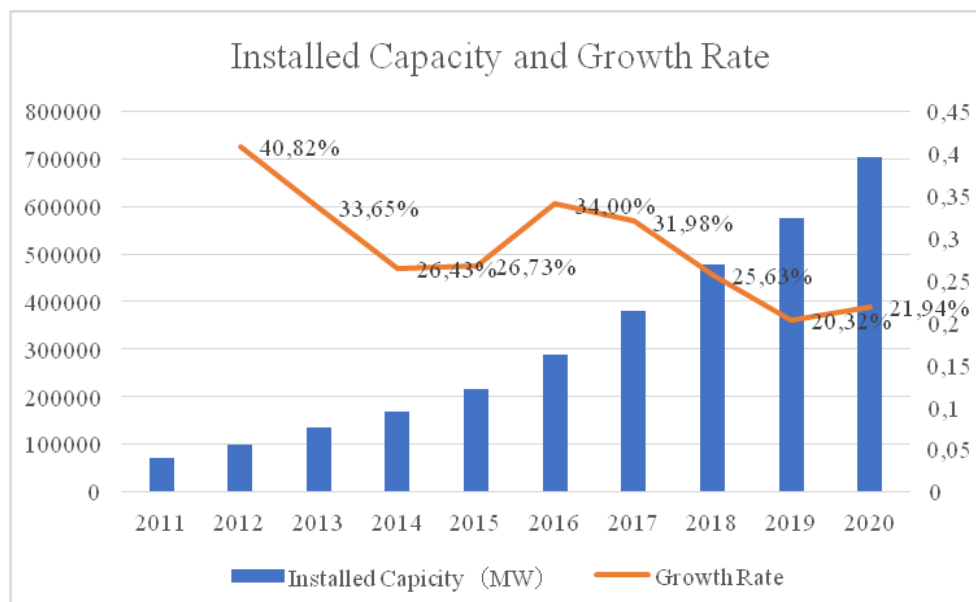


Fig. 1. – installed capacity and year-over-year growth rates in 2011-2020

Judging from the distribution of global photovoltaic installed capacity, Asia is the main market for photovoltaic industry. In 2020, Asia accounted for 45.95 percent of global installed capacity, followed by Europe with 21.77 percent.

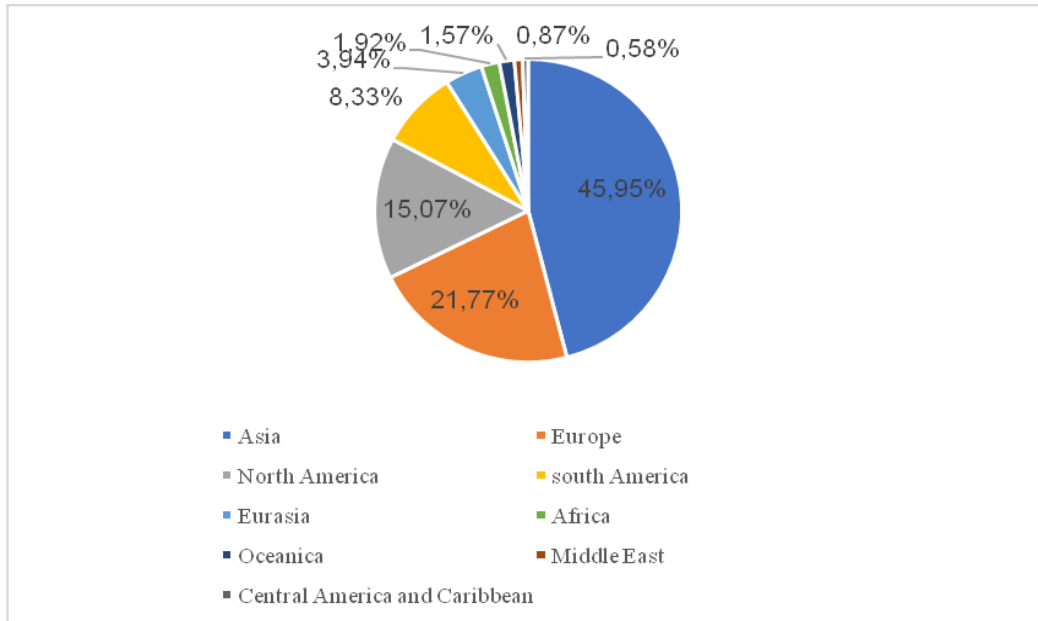


Fig. 2. – Percentage of installations in each region in 2020

In terms of countries, the top three major PV installed capacity in the world in 2020 are China, the United States and Japan.

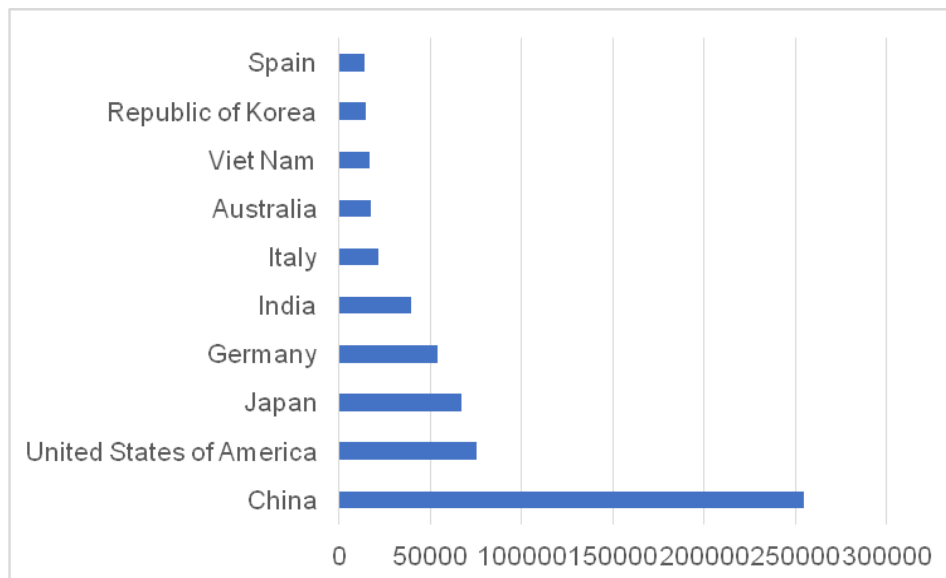


Fig. 3. – Photovoltaic installed capacity in major countries around the world by 2020

**c. Development trend of photovoltaic power generation**

From distributed generation to centralized power plant

The centralized large and medium-sized grid connected solar power station is the centralized infrastructure large and medium-sized solar power station. The power generation is immediately allocated to the public power grid, and the high-voltage transmission system software is connected to provide long-distance load, which can control the cost and reduce the transportation loss. The more large-scale photovoltaic power stations operate, the lower the cost of photovoltaic power generation system software is.

Light storage integrated power plant

For the photovoltaic power plants with energy storage technology stage, the integrated management and control should be carried out. Considering the maximum profit of active power output, "peak shaving and valley filling" should respond to the requirements of power grid production and dispatching, so as to ensure the power grid production and dispatching regulations immediately. The application of energy storage system can reduce the impact of battery charging on power grid and improve the quality of power grid as much as possible.

Technical application of cloud storage, cloud computing technology, digital twin, Internet big data, etc.

The application of new information technology can help photovoltaic power plants to realize intelligent system, assist photovoltaic power plants to realize intelligent operation and maintenance supervision, show the analytic function of power generation prediction and analysis, reduce the difficulty coefficient of grid connection, and improve the efficiency of power generation.

#### **d. Summary**

The fourth scientific and technological revolution will be carried out in an all-round way, and the technologies of green energy and Internet of things led by photovoltaic power generation are developing in an all-round way. According to the modern Internet of things, artificial intelligence technology and data analysis technology, we can realize the centralized operation and maintenance service of a variety of power energy including photovoltaic power generation, and create a smart power energy ecological chain. In the future, social development will build a new and upgraded energy Internet of things management system, into a low-carbon environmental protection and even carbon free period.

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