

Overview of the photovoltaic technology status and perspective in China



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ABSTRACT

The rapid rise of China as a dominant global player in the solar photovoltaic industry has drawn much attention from scholars and policy-makers. However, few literatures have launched an in-depth analysis of China's strategic promotion of the photovoltaic industry. This study aims to fill this gap. This paper investigates legislative and policy development along with industrial strategies which the Chinese government has pursued in order to encourage development in the photovoltaic industry and also in related research and development activities. Moreover, from the perspective of technological and industrial development trends, the authors carried out an analysis of China's photovoltaic industry chain, pointing out that China's photovoltaic industry has the potential to take one step further in the areas of research and development, and the possibility of achieving breakthroughs in international cooperation.

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1. Introduction

1.1. Background

Energy is a critical foundation for economic growth and social progress [1]. With the expansion of the population and development of the economy, traditional energy sources cannot adequately meet the needs of rapid economic development. Meanwhile, the environmental pollution resulting from the traditional energy consumption process has drawn more and more attention from governments worldwide [2]. Most countries regard the promotion of renewable energy as an important state strategy [3].

As the largest developing country in the world, China's economic development requires a huge supply of energy. Developing renewable energy is an inevitable choice for China's sustainable economic growth. Solar energy is a clean, safe, and reliable energy source for the future. Thus, the rapid rise of China as a dominant global player in the manufacture of solar photovoltaic (PV) industry has drawn much attention from scholars and policy-makers.

1.2. Literature review

Based on different focuses, scholars analyze factors affecting China's PV industry from several aspects, including technology, policy, and the market.

With respect to technology, Fang & Li believe that PV technology in China made PV applications grow rapidly in the past 10 years, and the PV enterprises should improve technological innovation to decrease their dependence on foreign technology [4]. Grau et al. indicate that large scale application of PV requires further technological improvements, and the industrial actors need to pursue innovation [5]. Tang et al. argue that crystalline silicon solar cells play a leading role in the photovoltaic market, and 15 top key technologies in the solar cell industrial chain are analyzed [6]. Liu and Shiroyama analyze three levels of PV technology in China from the perspective of transition theory [7].

Regarding China's PV industry policy, Zhi et al. focus on the Chinese government's industrial policies and indicate that China's PV policies are changing from production supply-side to demand-side policy domination [8]. Zhang and He asserted that China's solar PV incentive policies stimulate the promotion of the domestic solar PV market [9]. Zhang et al. argue that the development of policy determines the developmental trend of wind power and solar PV power in China [10].

With regard to the PV market, Wang et al. argue China's development of the PV industry mainly relies on the European market, and the domestic PV market could absorb the over-produced PV products over a long period of time [11]. Zhao et al. summarize five factors to describe the development of China's PV industry market [12]. Zhao et al. believe that Chinese PV market holds great opportunities and potential challenges in the development process [13].

Most literatures focus solely on aspect analysis, and few literature have launched in-depth analysis of China's strategic promotion of the photovoltaic industry. This study aims to fill this gap. The main purpose of this paper is to investigate the legislature and policy development along with the industrial strategies which the Chinese government has pursued in order to encourage development in the photovoltaic (PV) industry and also in related research and development (R&D) activities. It is based on previous studies and the latest data in 2013 and 2014. The literature survey covers the current studies on China's PV industry. A review of the laws and policies of China's PV industry is performed. The statistical data are primarily retrieved from public sources of Chinese government institutes, including the State Council of China, the National Development and Reform Commission (NDRC), the National Energy Bureau, the Ministry of Industry and Information Technology of the People's Republic of China (MIIT), etc.

This paper will take the first step in investigating the PV markets' global production capacity. Next, we analyze the solar energy legal and policy framework in China, and the positive effects of this framework on China's PV installation and industry. Third, this paper discusses PV industry development status, including the PV industry chain, PV application market in China, and R&D status of the PV industry. Finally, based on China's status of PV development, future strategies for the PV industry in China are suggested.

2. Global photovoltaic market and production status

The amount energy sources, including coal, the gas, water, the coal are decreasing day by day due to intense use in industry. On the other hand, the need for electrical energy is rising in parallel with developing technology [14]. The lack of limited fossil energy resources is a worldwide issue [15]. Renewable energy can play a critical role in achieving the goal of taking the place of large parts of fossil fuels. One of the important applications of renewable

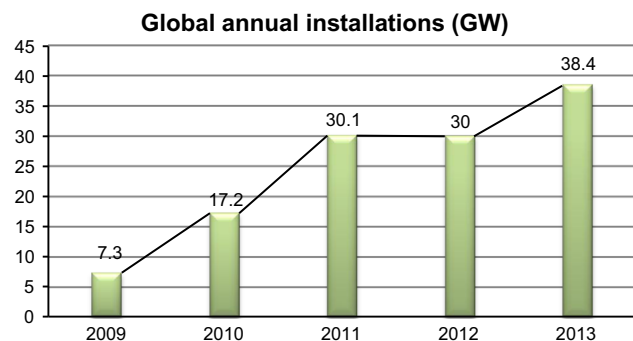


Fig. 1. Global annual installations from 2009–2013. Source: [23].

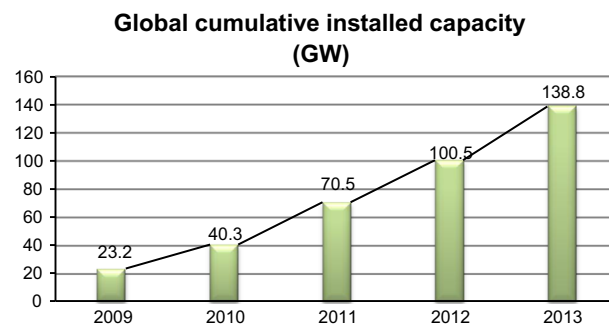


Fig. 2. Global cumulative installed capacity from 2009–2013. Source: [24].

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