CHAPTER 13

Development Potential for Wind and Solar Energy Resources in China

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Abstract

This paper introduces the current state of wind and solar energy resource development and utilization in China. Existing challenges are introduced and power potential, spatial distribution, and development costs are analyzed. The results reveal that wind and solar energy resources’ potential is enough to merit wind and solar power development. Finally, the paper discusses development and utilization safeguard policies for Chinese wind and solar energy, such as feed-in tariffs, cost allocation, smart grid development, distributed access, etc.

Keywords

wind energy resource – solar energy resource – grid connection – distributed development – electricity price – cost

I Current Wind and Solar Energy Development and Utilization in China

Countries around the world have adopted development and implementation of renewable energy as a significant measure for reducing fossil energy consumption, addressing climate change, conserving energy, and reducing emissions. In 2011, global renewable energy sources provided almost 50% of power capacity increase, and of that wind energy and photovoltaic technology contributed 40% and 30% of power generated by renewable energy

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respectively, and hydropower contributed 25%.\(^1\) By the end of 2011, the total installed renewable energy capacity around the world exceeded 1,360 GW, which represents an 8% increase in one year. From the end of 2006 to 2011, power generating photovoltaic technology experienced the fastest development compared with all other renewable energy sources, increasing average installed capacity by 58% annually. Concentrated solar energy increased by 37%, and wind power by 26%. Some developed countries set specific renewable energy installation goals. The EU set a target of reaching 20% of energy consumption from renewable energy by 2020. Spanish plans foresee renewable energy consumption accounting for 22.7% of Spain’s total energy consumption from 2011 to 2020, and clean energy sources providing 42.3% of its total power generation, placing it slightly ahead of the EU goal. Denmark has clearly stated that it will completely cut its dependence on fossil fuels for energy by 2050. The following 20 to 50 years will be ripe with important energy transformations.

Over the last ten years, along with rapid national economic development, energy consumption in China has increased every year (Figure 13.1). According to data from the BP Statistical Review of World Energy 2012,\(^2\) primary energy consumption in China reached 2.75 billion tons of oil equivalent in 2011, accounting for 22.4% of total global primary energy consumption. Renewable energy consumption in China equaled 180 million tons of oil in 2011, accounting for 17.9% of the total global renewable energy consumption. Since the “Renewable Energy Law of the People’s Republic of China” was issued in February 2005, the development and utilization of renewable energy resources has grown rapidly. By the end of 2011, China’s total installed renewable energy resource capacity ranked first in the world at 282 GW, a quarter of which (70 GW) was provided by non-hydroelectric renewable energy. Of the 90 GW of new energy installed in 2011, renewable energy contributed one-third, and non-hydroelectric renewable energy contributed one-fifth. The 12th Five Year Plan set the following development goals for China’s renewable energy for 2015: wind power generation shall reach 100 GW, providing an annual power generation of 190 billion kWh, and including 5 GW of offshore wind energy. Solar power generation shall reach 15 GW, with an annual power generation of 20 billion kWh. Adding the contributions from biomass, solar thermal, and nuclear power generation, the total non-fossil energy development shall reach 480 million tons of standard coal equivalent.

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