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# Clean distributed generation in China: Policy options and international experience



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## ABSTRACT

The development of distributed energy system is one of the important measures to promote energy production and innovation of energy utilization patterns of China. Combined with development status of distributed energy resources in China, this paper introduces the development emphasis and main goals of three distributed generation industries from natural gas, photovoltaic and distributed wind power, then describes the policies about distributed generation from three aspects: subsidy standard, grid connection and electrovalence mechanism. Moreover, it analyzes policy options and management experience in developing distributed generation of several typical developed countries, such as America, Germany, Japan and Denmark. Finally, aiming at further development of distributed generation in China, related recommendations on policy options are put forward from four aspects: policies, regulations, financing channel and development pattern.

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## 1. Introduction

At present, developing distributed energy is a significant method to promote the revolution of energy production and consumption. Distributed energy system is general item for the system achieving energy step utilization, stalled on the user side, providing power from renewable energy or fossil energy for private consumption. The system has lots of features: energy conservation, less investment cost, flexible operation pattern, improvement of security and economy in running grid system and promotion to the diversification of grid-connection patterns for renewable energy [1–3]. American scholar Jeremy Rifkin argued in his book “The Third Industrial Revolution” that the technical combination of the Internet and renewable energy would provide significant support for the sustainable development for the entire world, and settle powerful infrastructure for the third industrial revolution.

In January 2013, China government issued “Energy Development ‘Twelfth Five-year’ Plan”. To “promote revolution of energy production and utilization pattern” is listed on the top, including three areas: distributed energy, smart grid and energy supply facilities of new energy vehicles. The plan of developing distributed energy puts forward to conduct the comprehensive utilization of traditional energy, new energy and renewable energy, achieving the coordinated development between distributed generation and centralized generation. According to the plan of National Energy Administration, China will expend the development in cities having resource conditions of different patterns of distributed energy, such as cooling-heating-power supply, urban building photovoltaic and gas-turbine cogeneration heating for medium and small towns. To 2020, the total installed capacity of all kind of distributed energy is expected to reach 130 million kW, including that small scale hydropower will reach 75 million kW, multi-generation of natural gas will increase to 50 million kW, small scale wind power will run up to 3 million kW and urban building photovoltaic will achieve 1 million kW.

Due to the international finance crises and antidumping and countervailing action European and United States taken, the development of new energy industry of China, especially wind power and photovoltaic areas, has bottomed out since 2012. In 2013, the State Council, the National Development and Reform Commission (NDRC), the National Energy Administration, the Ministry of finance issue several policies in a row, aiming to promote the development of distributed generation. In October 2013, the National Energy Administration held a forum about promoting the application of photovoltaic distributed generation. The director general Wu Xinxiong pointed out that the development of photovoltaic application is a vital way to adjust the energy structure and promote the revolution of energy production and consumption, and is also a necessary measure to help photovoltaic enterprises out of the mire and promote the sustainable development of photovoltaic industry. On November 19, 2014, the State Council issued notice on printing and distributing the strategy planning of energy development (2014–2020). The “strategic planning” clears that China’s overall strategy and action program of energy development up to 2020, and it is the outline of energy development planning for its 13th Five Year Planning. Moreover, it stresses the need to actively develop natural gas, nuclear power, renewable energy and other clean energy, reduce the proportion of coal consumption, promote the continuous optimization of energy structure, and develop the centralized and distributed power generation. In such situation, China needs market mechanism and policy supports working to form the basis for overall construction of distributed energy system [4–8]. However, there is a lack of comprehensive and systematical study on the policy options of distributed generation in China. This paper will analyze the

development of policy options from three different types of distributed generation in China, including natural gas, photovoltaic and distributed wind. Moreover, on the basis of comparative analysis of China and other developed countries, the paper will summarize the advanced experience from four aspects which are the policies, regulations, financing channels and development patterns to provide effective suggestions for the policy options of developing distributed generation in China.

## 2. Status of distributed generation policy options in China

### 2.1. Natural gas distributed generation

As to the policies about gas distributed generation, China mainly includes “The ‘Twelfth Five-year’ Plan of Natural Gas Development”, “Guidelines for the Development of Natural Gas Distributed Generation”, and “Suggestions for Grid Connection of Distributed Generation” and “Policies for Utilization of Natural Gas” etc. [9]. Among them, “Guidelines for the Development of Natural Gas Distributed Generation” issued in October 9, 2011 pointed out that the comprehensive utilization efficiency of gas distributed energy for the whole year should be higher than 70%, and stall near the low voltage distribution network; in the developed area, high-quality demanding area (including ecological economic zone) or the region producing natural gas, the technology combined heat, cool and power generation is motivated to apply to construct demonstration project. In addition, the guidelines make specific rules for developing target, subsidies standard and grid connection of natural gas distributed generation. And the “Policies for Utilization of Natural Gas” explains the price fixing of distributed generation, shown in Table 1.

As shown in Table 1, China has gradually been attaching importance to natural gas distributed generation, and accelerating the construction of energy projects and demonstration areas. Meanwhile, fostering the manufacture and application ability of DG devices and production is the key to improve core-competitiveness. The government plans to achieve the devices localization rate up to 90% in five to ten years, primarily shaping DG devices industrial system having proprietary intellectual property rights. And the experience through demonstration projects would vigorously promote the development of distributed generation projects, industrializing the DG devices. When it comes to subsidies, it can only be applied for specific projects, and the detail will be negotiated in the future. As to grid-connection, the core is the corporate planning and harmony between electrical departments and government departments, and the rationality of operation mechanism. Regardless of price-fixing, due to the indeterminacy of relative price relationship between electricity tariff linkage mechanism of gas upstream and downstream and other energy, the government needs to further study and issue support policies about public finance, charges and heat price as soon as possible. Moreover, China has not yet introduced the detailed rules for the natural gas distribution subsidies. But it can be seen from Table 2 (regional subsidy policies for natural gas distributed generation), Shanghai and Changsha have formulated the regional detailed subsidies rules firstly. Beijing is also to launch the corresponding subsidies to promote the development of natural gas distributed power generation.

### 2.2. Photovoltaic distributed generation

As to the policies about photovoltaic distributed generation, China mainly includes “Notice of the National Energy Bureau on doing well in preparation of solar energy development ‘thirteenth five’ planning” “Notice of technical development of photovoltaic

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