Energy Policy 120 (2018) 550–558

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Targeted poverty alleviation using photovoltaic power: Review of Chinese policies

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ARTICLE INFO

Keywords:
Photovoltaic
Targeted poverty alleviation
Policy instruments
Content analysis

ABSTRACT

Photovoltaic-based targeted poverty alleviation has been designated as one of "the ten large-scale poverty relief programs" in China. In spite of remarkable achievements, a number of issues still need to be addressed. By employing content analysis, this article codes policy texts and then analyzes the Chinese policies of targeted poverty alleviation using photovoltaic power from two points of view: the basic policy instruments and the project procedures. Results indicate that the government emphasizes three types of basic policy instruments; goal programming, financing support and infrastructure construction. Compared to the number of supply-type policies and environmental-type policies, there is a deficiency in demand-oriented policy instruments. In terms of the project procedures, the policies of photovoltaic-based targeted poverty alleviation are concentrated on project construction and electric power (agricultural product) sales, followed by photovoltaic income distribution. The study suggests four main policies: i) there should be a reduction in the use of policy instruments pertaining to goal programming and an increase in the use of economic policy instruments; ii) re-examine the identification policies for low-income families; iii) deem operation and maintenance policy instrument of photovoltaic project phases to be important and reinforce technical support; iv) perfect the formulation of performance assessment policies, and strengthen dynamic management of photovoltaic projects.

1. Introduction

In the past five years, under the guidance of the poverty relief ideas proposed by General Secretary Xi Jinping ("Down-to-earth, adaption to local conditions, classified guidance and targeted poverty alleviation"), China has made great progress in targeted poverty alleviation: More than 60 million impoverished people have escaped poverty; poverty has declined from 10.2% to less than 4% of the population. However, targeted poverty alleviation is still tightly-scheduled and the elimination of poverty still involves a high degree of difficulty. Therefore, it is proposed in the Report of Nineteenth CPC Congress that, "It is a solemn promise of our Party to enable impoverished people and poverty-stricken areas to enter an all-round well-off society", which also means that tackling poverty elimination has become one of the more important strategic plans of the Chinese government.

China is among the countries with abundant solar energy resources, with more than 2000 sunshine hours in more than two-thirds of the country. This provides particularly favorable conditions for poverty alleviation using PV power (Zhang, 1995). As one of "the ten targeted poverty alleviation programs" designated for implementation by the Poverty Relief Office of State Council, PV-based targeted poverty alleviation is a focus of both the Chinese central government and local governments because it leads to stable power generation income, new-energy promotion as well as innovative energy-saving and emission-reducing measures. Targeted poverty alleviation using photovoltaic power refers to the laying solar cell panels on house roofs and agricultural greenhouses and marked by "spontaneity, self-use and grid-connection of surplus"; in other words, farmers can use the electric energy on their own, and sell surplus electric quantity to the state grid. PV-based poverty alleviation will benefit both poor farmer families investing in projects and photovoltaic enterprises, because the latter can obtain profits by selling photovoltaic modules, investing projects and maintenance. The mutual benefits of this program may well lead to an increase in regional GDP.

Aiming at targeted poverty alleviation using photovoltaic power in China, a series of policy documents have been successively

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https://doi.org/10.1016/j.enpol.2018.06.004
Received 22 February 2018; Received in revised form 27 May 2018; Accepted 2 June 2018

promulgated: In 2014, The National Energy Administration and the State Council Poverty Relief Development Leading Group Office jointly printed and issued *The Work Scheme on Carrying out PV-based Poverty Relief Projects*, deciding to develop PV-based power generation poverty-relief projects for the industry within 6 years. In 2015, The Department of New Energy and Renewable Energy of the National Energy Administration put forth *the Program for Compilation of PV-based Poverty Relief Implementation Scheme (Trial)*. In 2016, the National Development and Reform Commission, the State Council Poverty Relief Development Leading Group Office, the National Energy Administration, the China Development Bank and the Agricultural Development Bank of China jointly issued *Proposals on Implementing the Poverty Relief of PV-based Power Generation*, stipulating that "before 2020, improvements to overall villages will be made, particularly in the 35 thousand poverty-stricken villages in China (for which files and cards have been established), in the 16 provinces where pilot projects have been carried out and in those that have better sunlight conditions. Each of the 2 million poverty-stricken families unable to work, and for which files and cards have been established (including those that are handicapped), shall be paid an additional income of more than 3000 Yuan every year" (National Development and Reform Commission, 2016) (see Fig. 1).

In terms of practice, some PV enterprises have made remarkable achievements in their poverty-relief projects. Hareon PV is developing the 5 MW PV poverty relief pilot project in Xinrong Village, Hongguang Town, Helan County, Ningxia Hui Autonomous Region. In one of the first PV pilot provinces/regions nationwide, Hareon PV is installing solar PV module panels on the roofs of more than the 1800 village homes that house poor farmer families. This entails an investment of about 26,000 Yuan in the roof power generation system for each family. Each farmer family that participates in this project can earn a roof rent of 300 Yuan each year. After grid connection for power generation, villagers can increase their income by selling electricity. In another project, AKCOME (Jiangsu Akcome Science & Technology Company) and Xunwu County, Ganzhou City, Jiangxi Province signed a long-term agreement of strategic cooperation and are developing a 100-MW PV power station construction project based on agriculture-PV mutual supplementation in Xunwu County. This project has a total investment of up to 980 million Yuan and can effectively implement PV poverty relief, meet the basic needs of rural low-income families, bring them a stable income for 20–30 years, and eliminate poverty through continuous income growth[1] The annual income of low-income families in another agriculture-PV mutual supplementation project, in Liulaozhuang, Huai'an City, is more than 3000.[2] However, because of an imperfect land system and lack of grid renewal and updating, as well as the low investment income for a number of enterprises, some PV-based poverty relief projects are almost in a state of stagnation or even deficit, and some regions or farmer families have even returned to poverty.

In spite of the successes, the targeted alleviation of poverty through the use of PV power still faces a number of difficulties, the most prominent being: i) The single-index poverty identification instead of multi-dimensional index has received attention than selection. Many areas identify the poverty households using only one indicator, neglecting expenditure or education. ii) While both the central government and local government have set the goal of farmers' income for the poverty alleviation program, they have not paid enough attention to the income of investment enterprises. iii) A large number of local governments have failed to integrate the development of PV power with the industries of rural tourism, fishery farming, greenhouse vegetable and fruit cultivation. iv) Local governments attach great importance to project construction, while ignoring follow-up appraisal of operation. Therefore, systematically sorting out policy texts and correcting those areas where there are overflows and the deficiencies of policy instruments is extremely important if China is to steadily increase PV-based poverty relief. These are the main contribution of this article.

Fig. 1. The key implementation regions of PV-based poverty alleviation projects.

2. Literature review

Applying and popularizing green energy is an important measure taken by some developing countries to increase the income of their poverty-stricken population, improve the renewable energy technologies and the GDP of local regions (Oh and Yoo, 2014; Long et al., 2015). This has intrigued a number of scholars (Utria, 2004; Bhutto and Karim, 2007; Openshaw, 2010; Urge-Vorsatz and Herrero, 2012; Chakravarty and Tavoni, 2013; Mohan et al., 2018). However, any literature directly related to the targeted PV poverty alleviation is extremely rare. Although a considerable part of the research related to poverty alleviation only looks at general industries, it can still be used for reference.

The vigorous boosting of industrial development is one important way of achieving poverty alleviation. This poverty alleviation through industry relies on technical support, infrastructure construction, personnel training and other types of industrial policies. As emphasized by Liu and Li (2017), this can be achieved through the collecting of large amounts of data, pushing the improvement of infrastructure, and boosting the tourism industry and other local industries. Li (2016) emphasized the important role of agricultural science and technology in increasing farming incomes and eliminating poverty. Not only in China, but also in the African regions with disadvantageous natural environments south of the Sahara, attention focuses on instruments of scientific and technological poverty alleviation. According to Jennifer and Smallholder (2012), the introduction of small-scale agricultural irrigation technology can effectively ensure the grain security of poverty-stricken villagers, increase their income and promote the implementation of poverty-relief strategies.

Education and training are also long-acting mechanisms for reinforcing targeted poverty alleviation. Take the mining industry for example, Ge and Lei (2013) pointed out the government could help both those in poverty who lack specific skills and some low-income families to master skills through education and training in their industrial poverty-relief policies. This would ensure the full utilization of those industrial poverty-relief policies.

In developing countries, including above-mentioned tourism industry, new energy represented by biomass (Openshaw, 2010) or solar energy is also an effective means of bolstering sustainable development

[1] The data of Hareon PV and Jiangsu Akcome Science & Technology Company comes from Jiangyin municipal committee research office, China.

[2] The data comes from the poverty alleviation office of Huai'an, China.