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Analysis of DSPV (distributed solar PV) power policy in China

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ABSTRACT

DSPV (Distributed solar PV) power, either located on rooftops or ground-mounted, is by far one of the most important and fast-growing renewable energy technologies. Since the second half of 2012, China has shifted from LSPV (large-scale solar PV) to DSPV and a series of policy to promote DSPV power deployment have been put in place. Unfortunately these policies were not well performed due to myriad constraints on DSPV power deployment across the country. Building mainly on non-academic sources including government documents and presentations, industry reports and presentations, media reports, and interviews, this paper firstly provides a comprehensive review of China's policy on DSPV passed between the second half of 2012 and the first half of 2014, then barriers associated with DSPV deployment are identified. This is followed by an account and discussions of recent policy changes since Sep 2014, and major local incentives. In addition, policy performance is briefly reviewed. At the end of the paper, conclusions and policy implications are provided. This paper provides an understanding of the recent DSPV policy progress in China and insights for policy makers in other economies which are experimenting DSPV power policies.

1. Introduction

Solar PV power is currently, after hydro and wind power, the third most important renewable energy source in terms of globally installed capacity. More than 100 countries use solar PV power. As of the end of 2014, the total installed capacity of solar PV in the world reached 177 GW, accounting for 1% of the world electricity generation [1]. The major installations of solar PV power are ground-mounted LSPV ((utility scale or large scale) PV) power and DSPV power. DSPV power projects have different definitions. For instance, according to the National Development and Reform Commission of China and the State Grid of China, DSPV power projects are defined as projects with generation on or close to the user site, instantaneously consumed by end users themselves, i.e., self-consumed, and for which excess power can be grid-connected and the system can be balanced in the grid [2], with project sizes smaller than 6 MW [3]. Whatever the definition is, DSPV power is the solar energy—essentially rooftop and small, local, plants, that is either not sent to a grid, or, may be supplied to a local distribution network rather than to a high-voltage grid.

DSPV power projects has several advantages over remote LSPV power projects: (1) By being situated close to demand centers, the total energy and economic efficiency of the energy system is enhanced as line losses and the investment costs in the transmission infrastructure could be reduced or eliminated; (2) Typically installed on rooftops, it requires little land, which is at a premium in China.

DSPV power has become a noticeable source of electricity generation in Germany, the USA and Japan. In China, though DSPV power generation dated back to 1996 when the Brightness Program was initiated, which was followed by the Township Electrification Program in the late 2002, domestic solar PV power market – both LSPV power and DSPV power – didn't see much growth due to lack of support from the government until 2009 when two national subsidy programs for DSPV power projects, namely the Rooftop Subsidy Program and the Golden Sun Demonstration Program, were implemented, in the hope of incentivizing domestic demand to rescue domestic ailing solar PV manufacturing industry suffered from the 2008 global financial crisis.[1] Thanks to these two national

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[1] During the period 2004–2008, driven jointly by the explosive growth of global demand for solar PV starting in 2004 as well as by a number of domestic factors, China' solar PV policy was export-oriented and over 95% of its solar PV products were exported.

subsidy programs, DSPV market has expanded. By the end of 2012, the cumulative capacity of DSPV across China reached 2.5 GW, accounting for 36.4% of the solar PV market [3,4].

Though these two projects did stimulate domestic market, to some extent they have also contributed to the overcapacity in China's PV manufacturing industry. Overcapacity coupled with trade tensions with the U.S. and Europe over China's solar PV products since the end of 2012, prompted the government to increasingly attach importance to its booming domestic solar market [5]. Given that the retail/commercial electricity tariffs are high in the eastern provinces, and the lack of grid transmission and land availability will constrain utility scale projects in the country, the government decided to attach more emphasis on distributed installations.

As a consequence, since the second half of 2012 China's DSPV market development strategy has witnessed a series of policy changes aimed at making DSPV power development an equal priority with LSPV power development. However, the DSPV power market has not developed as expected. The share of DSPV power in the total cumulative capacity of solar PV in the country was only 16.65% in 2014, and the new installation of DSPV in the year was only 2.05 GW, lagging far behind the target of 8 GW set by the government in the beginning of 2014 [6].

Our literature review shows that along with the solar PV industry development over the past decade and the emergence of China's domestic solar PV appliance market, studies have provided accounts for Chinese solar PV policy and development [3,4,7–9]. Yet, to the best of our knowledge, literature specifically focused on DSPV power deployment in the country is few. A few exceptions are Yuan et al. [9] and Zhang et al. [10]. While Yuan et al. [9] employed analytical framework of LCOE (levelized cost of electricity) to estimate the generation cost of DSPV in China, Zhang, et al. [11] reviewed China's DSPV market development and policy changes since 2013, presented cost and time requirements for installing DSPV in China, which provide some insights for this study.

Nevertheless, comprehensive studies on China's DSPV power policy progress from the end of 2012 to early 2015 seem unavailable. The purpose of this study is to fill this gap. To this end, the paper is organized as follows. Section 2 presents the DSPV power policies implemented from the second half of 2012 to the first half of 2014; Section 3 analyzes the major constraint on DSPV power deployment in the country, which provides the reasons for new policies. This is followed by Section 4 which makes a comprehensive analysis on the policy changes since Sept., 2014. In response to the call from the central government, many local governments have also promulgated a number of policy incentives. Section 5 gives a brief account of these incentives of the selected provinces and municipalities. DSPV policy performance is analyzed in Section 6. In the last section we provide conclusions and policy implications.

This study is built on data sources and interviews. The data sources are mainly from non-academic sources like industry reports and presentations, websites, media report, government documents and presentations. The interviews were conducted during Sep., 2014 and May 2015 at several national solar PV power conferences or through skype and WeChat. Our interviewees include eight DSPV project developers, two government officials, three renewable energy policy researchers, three managers from grid utilities and six bankers. Interviews elicited information on the main constraints in the process of completing projects. Most managers interviewed had been engaged in PV deployment and/or research and development for at least three years.

The eight DSPV project developers are selected from China's eastern cities in Jiangsu and Zhejiang province and Shanghai municipality which are the main locations of DSPV projects in China. The three government officials are from the Department of New Energy and Renewable Energy under the NEA (National Energy Administration). The three renewable energy researchers are from the Energy Study Institute affiliated to NDRC (National Development and Reform Commission). The three managers from grid utilities are involved in implementing the policies. Among the six bankers, three of them are from China's policy banks, two are from the National Development Bank of China and one is from the Export and Import Bank of China, the other three are from China's national commercial banks.

2. DSPV policy between the second half of 2012 and the first half of 2014

In this section, we provide accounts for China's DSPV power policy regime during the second half of 2012 and the first half of 2014. The key government document which represents the milestone of DSPV development at this stage is the *Opinions on Promoting the Healthy Development of Solar PV Industry* issued by the State Council on July 15, 2013 [12]. Subsequent to the promulgation of this document, more than 30 national documents with regard to specific aspects of DSPV power development have been put in place (Table 1). We group the policies provided in these documents into four categories: (1) Scale control and registration management; (2) On-grid tariff, subsidy, financing and fiscal incentives; (3) Market promotion: establishment of demonstration areas of DSPV power generation, and (4) Power grid-connection, measurement and settlement policy.

2.1. Scale control and registration management

(1) Scale control. As in other countries, due to its high upfront cost, DSPV power in China requires government financial supports. If we suppose 6 GW DSPV power is installed each year and a minimum of 7 billion kWh power is generated, then the total subsidy required from the government would amount to CNY2.94 billion[2], based on the government subsidy policy of CNY0.42 per kWh (For subsidy policy, see Section 2.2 in this paper). As such, it is necessary to control the scale of DSPV power projects which require government subsidy. The scale control policy provides that the provincial energy authority shall propose the application for the national subsidy according to the local development of the DSPV power projects. The NEA will issue the scale for the next year after coordination of the scale application of the DSPV power generation across the country, and any unused quota will automatically lose effect in the subsequent year. It has to be noted that the quota is limited to the project enjoying the national subsidy. This suggests that any DSPV power projects do not enjoy national subsidy buy receive local policy incentives are not subject to the scale control [12–14].

(2) Registration management. Except DSPV demonstration areas where the application and approval are made uniformly, other DSPV projects enjoying the national subsidy are applied with the registration management. DSPV projects are required to register with local energy administrations. Detailed registration process is confirmed by the provincial-level government. Permitting process for DSPV is streamlined. Requirements are waived for generation business licenses, planning and site selection, land pre-approval, water conservation, environmental impact evaluation, energy conservation evaluation and social risks evaluation.

[2] CNY1 is approximately equivalent to USD0.1613.