



The 8th International Conference on Applied Energy – ICAE2016

Economic impacts of wind and solar photovoltaic power development in China

Yanxia Li^a, Wenjia Cai^{a,*}, Can Wang^{a,b}

^aMinistry of Education Key Laboratory for Earth System Modeling, and Center for Earth System Science, Tsinghua University, Beijing, China

^bState Key Joint Laboratory of Environment Simulation and Pollution Control (SKLESPC), and School of Environment, Tsinghua University, Beijing, China

Abstract

Recently, wind and solar PV power industries have entered a stage of large-scale development in China. In this study, scenarios and an input-output model are built to assess the economic impacts of wind and solar PV power development in China from 2016-2030. Compared to the reference scenario, more added value is brought about in the development scenario while both scenarios generate the same amount of electricity. In the development scenario, the quantitative analysis implies that the added value brought about by wind and solar PV power industry, directly and directly, is about 5.0 times in 2030 more than that in 2015. During 2016-2030, about 8674 billion RMB (1300 billion dollars) and 6949 billion RMB (1042 billion dollars) added value could be generated respectively by wind power industry and solar PV power industry, accounting for about 0.58% and 0.47% of GDP. In addition, the main interdependent industries stimulated by wind power industry or solar PV power industry are different from those stimulated by coal-fired power industry.

© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the scientific committee of the 8th International Conference on Applied Energy.

Keywords: economic impacts; wind power industry; solar PV power industry; input-output model.

1. Introduction

In recent years, wind and solar PV power industry have formed a relatively complete industrial chain, and has entered a stage of large-scale development in China [1]. Development of wind and solar PV

* Corresponding author. Tel.: +86 106-279-4115; fax: +86 106-279-4115.
E-mail address: wcai@tsinghua.edu.cn

power has multiple impacts on environment, economy and society, such as greenhouse gas mitigation, energy security, air quality improvement, green economic development and so on [2-9]. Among all these impacts, the economic impacts play very important roles in deciding whether or not to carry out an economic activity. Though cost of wind and solar PV power generation is higher than that of coal-fired power generation currently, investment in wind and solar PV power industry will stimulate development of other interdependent economic sectors and contribute to GDP growth. It is a field worthwhile to be further studied and some researches on direct economic impact assessment have been conducted. However, indirect economic assessment of China's wind and solar PV power industry still remains to be further studied and supplemented. In addition, what the economic impact of wind and solar PV power generation replacing coal-fired power generation at an economy-wide scale is also worth studying.

Therefore, the aim of this study is to quantitatively assess the impacts of wind and solar PV power development on economic issues such as sectoral output and GDP by applying scenario analysis and an I/O model. Besides, the economic impact of wind and solar PV power generation replacing coal-fired power generation is also analyzed. The economic impacts in this study refer to the direct and indirect economic gains stimulated by wind and solar PV power development. The results can provide more comprehensive references for the public and policy-makers, especially when China's economy development speed is slowing down.

This paper is organized as follows. Section 2 introduces methodologies for studying the economic impacts of wind and solar PV power development in China. Results and discussions are displayed in Section 3. Finally, Section 4 draws further conclusions based on those results.

2. Methods

By summarizing previous articles [5,10-16], there are mainly four types of methods to analyze the economic impacts of renewable energy like wind and solar PV power. (1) largely spreadsheet-based analytical model [10-12], (2) econometric model [13], (3) CGE model [14], and (4) economic input-output (I/O) model [5,15,16]. Among all these methods, the I/O model is most suitable to analyze the direct and indirect economic impacts when the data is sufficient, as it's clear in structure and intuitive in results. Therefore, in this study, a special I/O model is established to study the economic impacts of wind and solar PV power development in China from 2016 to 2030.

2.1. definition of economic impacts in this study

The economic impacts in this study are defined as the gross output value and the added value generated directly or indirectly by wind and solar PV power industry. Difference of economic impacts between the reference scenario and development scenario reflects the net economic benefits of wind and solar PV power development. Also, the distribution of economic impacts on the interdependent industries stimulated by wind and solar PV power industry is discussed, which has been compared with coal-fired power industry.

2.2. setting of scenarios

In order to study the economic impacts of China's wind and solar PV power industry from 2016 to 2030, this study sets up two scenarios for China's power generation sector, the reference scenario and the development scenario. The development scenario is set to represent the development of power generation sector that is most likely to occur through 2030, where installed capacity and power generation of each power technology are set according to Policy Baseline Scenario of the DERC-P power sector model,

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات