

A REVIEW OF WIND POWER PRICING RESEARCH BASED ON BIBLIOMETRIC

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Overview

With the increasing negative effects of fossil fuel combustion on the environment in addition to limited stock of fossil fuel, many countries have paid more attention on supporting environmentally friendly energy generation, particularly renewable and sustainable energy sources. Electricity pricing mechanism plays a vital role to mitigate the crisis of fossil energy availability and promote renewable energy consumption. As one major type of renewable energy, wind power has been globally promoted. In order to promote the application of wind power, appropriate wind power price (WPP) should be regulated. This paper targets such a field and conducts a bibliometric and network analysis based on the Scopus. The review results uncover the evolutionary pathway of WPP related studies, including the key journals that published WPP related papers, major authors and their affiliated countries and institutions, as well as major academic communities having key impacts to such a field. A systemic and quantitative image about the evolution of WPP related studies is provided so that all the relevant researchers can better understand the research progresses and hotspots so that they can identify the appropriate directions for their future study.

The paper is organized as below. After this introduction section, research methods are described in Section 2, including data sources and treatment. Section 3 presents empirical results and discusses such results. Finally, section 4 draws research conclusions and provides policy implications.

Methods

- Bibliometrics.** Bibliometric analytic technique is a multifaceted endeavor covering structural, dynamic, evaluative and predictive scientometrics. It is a method to quantitatively analyze academic literature using mathematical and statistical techniques, which has been widely used in various disciplines. In this paper, we analyzed core literature co-citation to understand the evolution of the main research themes.
- Complex network.** Network analysis serves as a lens on the insights underlying a network of nodes and links through which information or social relationships travel. We applied it to a network established with the nodes that represented articles, keywords, or countries to evaluate the importance and influence of a node in the network. Among various software tools, Gephi is used frequently for the visualization of networks and the mathematical calculation.

Results

The keywords “wind power price” and “wind electricity price” were used to search the related publications published during the period of 1997 to 2014. Only research articles, conference papers and review papers published in English are further analyzed.

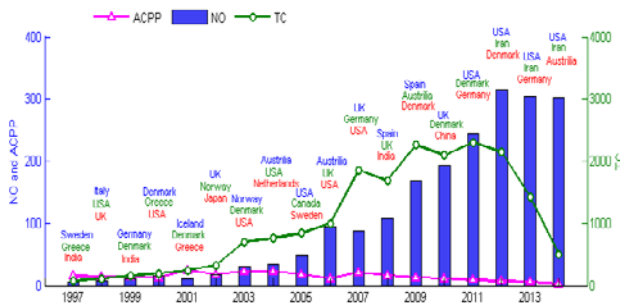


Fig.1. Numbers of NO, TC and ACP.

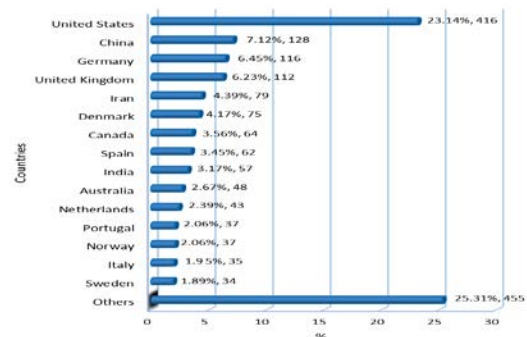


Fig.2. The top 15 most productive countries.

First, It is clear that the NO increased slowly in the first 8 years and then experienced a quick increase in 2006. In the year of 2005, the group of seven (G7) countries held a meeting to discuss how to encourage the development of alternative energy sources in order to respond higher crude oil price. As a result, more studies on WPP have been published since then although the total amounts of published papers slightly reduced in 2013 and 2014. Also, the TC grew constantly, and reached the peak in 2011, while the ACP decreased during the period of 2007-2014 (Fig.1).

Second, All the searched 1994 articles were published in a total of 857 journals (or conferences) which could be indexed in Scopus. This indicates the breadth of publication distributions as well as the broad interests on WPP related research from various perspectives. Energy Policy was an academically productive journal though with relatively lower impact factor. IEEE Power and Energy Society General Meeting provides the world's largest forum for sharing the latest in technologies development in the electric power industry.

Third, The number of publications for one country reflects their attentions and overall strengths in the related research fields (Fig.2). These top 15 countries published a total of 1343 articles, accounting for 74.69% of the total publications. Also, these most productive countries have larger CICs. But it not true in the academic cooperation network among counties, especially for China and Iran (Fig.3).

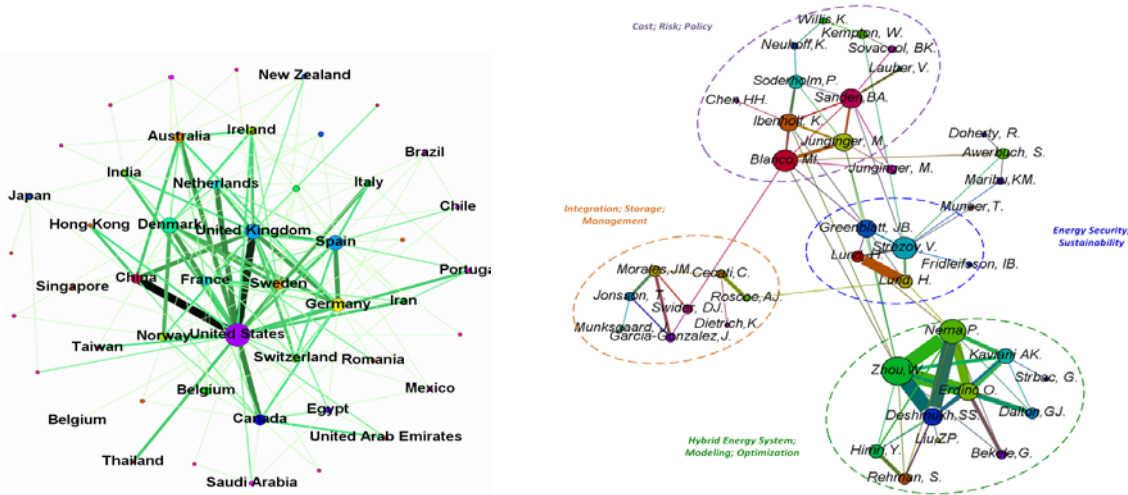


Fig. 3. The academic collaborative relationships. Fig. 4. Co-citing network among top 60 cited articles.

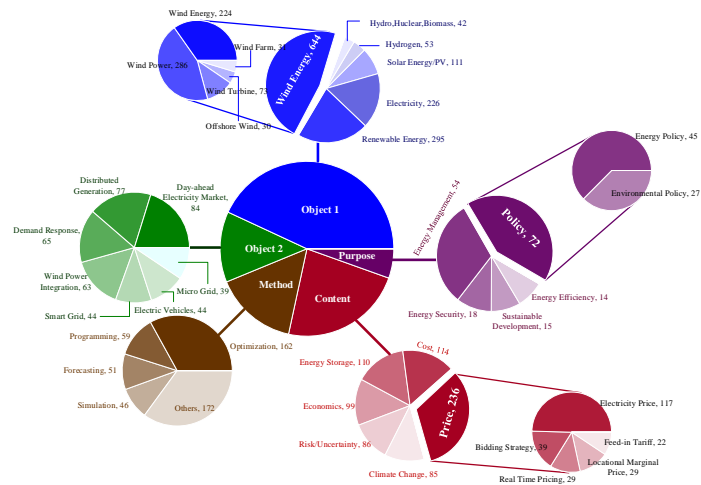


Fig. 9. Distributions of keywords

Fourth, the variation of annual citations for the most cited articles shows an upward tendency with different extents. And the co-citing network of the top 60 most cited articles reveals the community structure with various research themes (Fig.4).

Fifth, The frequency of author keywords and their ranks follows the power law distribution, indicating that the majority of author keywords are not used frequently and only a small number of author keywords are widely employed. The co-keywords clustering analysis for identifying current research directions and hotspots of WPP is conducted. It is classified into five types with a total of many small research themes(Fig.5).

Conclusions

Based on the data from Scopus, the characteristics such as the publication outputs, journal performance, academic collaborative relationships, co-citing relationships among most cited articles and hot points of the WPP related literature were analyzed via the bibliometric technique. Through bibliometric and network analysis of WPP, we have created a systemic and quantitative image of the evolution of the WPP research field and community, which gives WPP researchers an underpinned overview of the WPP research and may help them to identify new directions and synergy in worldwide research. Similarly, the hot points in WPP were analysed to provide a reference for future research endeavors.