Renewable and Sustainable Energy Reviews 91 (2018) 613–619

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

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

A review of China's carbon trading market

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ARTICLE INFO

Keywords:
China
Carbon trading market
Policy
Suggestion

ABSTRACT

One of the greatest constraints currently affecting China's economic development is climate change, with its associated restrictive conditions. Consequently, the application of appropriate actions to conserve energy and reduce emissions features centrally in China's core national development goals and development policies. These goals not only pose significant challenges and opportunities, but they also entail an important innovation. Under the framework of the Kyoto Protocol, the carbon trading market has emerged at a historic moment as an important measure for conserving energy and reducing emissions. Given the continuous development of the international carbon trading market over the last decade, China is also attempting to develop its own carbon trading market to further contribute to energy conservation and emissions reduction. Based on an analysis of the current situation of China's carbon trading market, relevant policy suggestions are offered here for its improvement, with the aim of providing guidelines for reducing carbon emissions, which are of mounting concern.

1. Introduction

Sustainable growth of the Chinese economy entails a corresponding rise in energy consumption. China's carbon emissions per head of population exceeded those of the European Union (EU) for the first time in 2013, according to the global carbon emissions data released by Global Carbon Program which is an organization seeks to quantify global carbon emissions [1,2]. Each person in China produced 7.2 t of carbon dioxide on average, compared with 6.8 t in Europe citing a study by the University of Exeter's College of Engineering, Mathematics and Physical Sciences [1,2]. In 2014, total global carbon dioxide emissions amounted to almost 35.5 billion tons, with China's emissions ranked highest, worldwide, at 9.76 billion tons [3,4].

The government of China has released the country's 13th Five-Year Plan (2016–2020) for economic development. This document takes stock of recent changes in the Chinese economy and energy systems that have occurred since the turn of the millennium and projects the likely trajectory of Chinese emissions over the next decade [4–7]. The current Plan establishes basic requirements and goals in areas such as energy consumption and environmental quality up to 2020. In particular, it emphasizes mandatory targets instituted over the past decade to reduce energy use, curb air pollution, and promote the development of non-fossil energy [8]. The Plan calls for an 18% reduction in carbon intensity, which is a measure of how much carbon dioxide is emitted per unit of gross domestic product. This target is slightly higher than the 17% target set in 2011 [5–8]. The latest Plan also seeks to limit the country's total energy use, with the aim of capping total energy use equivalent to 5 billion tons by 2020 [5,7].

The carbon-constrained goal of the Chinese government is to achieve a peak in 2030 for carbon dioxide emissions and a decrease of 60–65% in carbon dioxide emissions per unit GDP compared with the amount of emissions in 2005 [6–10]. Further, the government aims to increase the share of non-fossil fuels in primary energy consumption to around 20% and to increase the forest stock volume by around 4.5 billion cubic meters compared with 2005 levels [6–10]. The Paris Agreement was formulated in December 2015 during the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, France. On April 22, 2016, China signed the Paris Agreement, and promised to take steps proactively to reduce its domestic greenhouse gases and to strengthen international cooperation on the climate change issue. These actions reflect China's commitment and responsibility relating to global climate governance [8–10].

The question of how to cope with mounting pressure to address the increasingly alarming situation regarding emissions has gained considerable attention [11–13]. China is currently undergoing a major structural transformation associated with the implementation of a new development model that is more sustainable and inclusive than the current one. Energy-saving emissions reduction is not only a necessary requirement for countering climate change, but it is also critical for accelerating a shift in China's current model of economic development toward low-carbon and green development [11–13].

Under the framework of the Kyoto Protocol, the carbon trading market has emerged at a historic moment as an important measure for

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https://doi.org/10.1016/j.rser.2018.04.026
Received 15 September 2016; Received in revised form 13 April 2018; Accepted 14 April 2018

saving energy and reducing emissions. On May 9, 1992, the UNFCCC emerged as the outcome of difficult negotiations conducted between member countries of the United Nations Intergovernmental Panel on Climate Change [12]. At the third conference of the parties to the UNFCCC (COP3), the "Kyoto Protocol" (referred to as the "Protocol") was adopted in December 1997 in Kyoto, Japan. Under the Protocol, the mechanism of the market was conceived as the new pathway for reducing greenhouse gas emissions. Accordingly, carbon dioxide emissions are conceptualized as a kind of tradable commodity, with the carbon trading market referring to the carbon emissions trading market, or to a real carbon credit market that centers on carbon emissions trading [11–14].

To promote the development of green and low-carbon development, and to effectively deal with global climate change, the Chinese government has implemented a number of measures aimed at controlling greenhouse gas emissions [15,16]. The most remarkable achievement has been the development of the China's carbon trading market in recent years [11–13]. Carbon trading is being applied as a market mechanism for reducing China's carbon dioxide emissions and mitigating climate change. This paper presents a review of the development and status quo of China's carbon trading market. The problems facing China's carbon trading markets are identified and policy recommendations are offered for unifying the national carbon trading market.

Thus, our aim is to review the evolving process of developing China's carbon trading market to date and to offer suggestions for optimizing this market. The remainder of the paper is organized as follows. Section 2 presents an outline of the development of the China's carbon trading market. In Section 3, the current situation of the China's carbon trading market is discussed. In Section 4, challenges facing the China's carbon trading market are explored, and suggestions are offered on how these challenges can be met. Last, Section 5 presents the conclusions of the study.

2. Development of the China's carbon trading market

Carbon trading is an environmental management tool for controlling carbon emissions [17]. By putting a price on CO_2 and allowing emitters to buy and sell reduction obligations, an emissions trading scheme (ETS) is implemented. One party that generates more emissions could purchase the right to emit carbon from another party that generates a lower level of carbon emissions. The buyer can then use the emission reductions to mitigate the greenhouse effect and achieve the goal of reducing emissions [17,18]. At present, the major international carbon emissions trading markets are the EU Emissions Trading System (EU ETS), the Regional Greenhouse Gas Initiative (RGGI) implemented in the United States, California's Cap-and-Trade Program, the Tokyo Cap-and-Trade Program, the New Zealand Emissions Trading Scheme, and South Korea's carbon trading program. Among them, the EU ETS has the largest trading volume in the world, and it accounts for about 90% of the global carbon trading scale [17,18]. The first official document in China to mention carbon trading was "Decision of the State Council on Accelerating the Fostering and Development of Strategic Emerging Industries" released in October 2010 [19]. Carbon trading also features in the country's 12th Five-Year Plan (2011–2015) and other documents. The development process of China's carbon trading market has been gradual, commencing with a "The Work Plan for Greenhouse Gas Emission Control during the 12th Five-Year Plan Period" issued at the end of 2011 [20]. Such initiatives were aimed at exploring the establishment of a carbon emissions trading market in China [20–25].

The launching of carbon trading market pilots in China is indicative of the development status of the China's carbon trading market [17]. On October 29, 2011, to fulfill the requirements for gradually establishing a domestic carbon emissions trading market during the period of the 12th Five-Year Plan, the office of the National Development and Reform Commission (NDRC) issued a "Notice on Carrying out the Carbon Emissions rights Trading Pilot Work". This notice announced the agreement to initially conduct carbon emissions trading pilots in Beijing, Tianjin, Shanghai, Chongqing, Hubei Province, Guangdong Province and Shenzhen [21]. The sites selected by the NDRC for the pilots are highly typical. These areas span the eastern coastal areas, extending to the central region. They encompassed an area of 48 million square kilometers, with a total population of 0.262 billion, a total GDP of 15.5 trillion Chinese Yuan (CNY), and energy consumption amounting to 887 million tons of standard coal. In addition, "Interim Measures for the Administration of Voluntary Greenhouse Gas Emission Reduction Transactions" and "Interim Measures for the Administration of Carbon Emission Permit Trading" were issued in 2012 and 2014 respectively to guide the carbon trading market in pilots and to promote the establishment of a national carbon emission trading market [22,23].

In 2014, online transactions had been initiated within all seven pilots according to statistics provided by the NDRC. More than 1900 companies and services were involved in the pilots, and the total amount of their allocation of carbon emissions was about 1.2 billion tons. Up to the end of 2015, the seven pilot carbon markets had achieved a cumulative turnover of nearly 80 million tons valued at over 2.5 billion CNY.

From a macroscopic perspective, the pattern of trading behavior among market participants demonstrated a significant shift in 2015 [24]. The compliance rate in 2015 showed a marked increase compared with the rate during the same period in 2014. In 2014, only the Shanghai pilot achieved a compliance rate of 100%, whereas in 2015, Beijing, Guangdong, Shanghai, and Hubei also achieved a compliance rate of 100%. The market also expanded in 2015, compared with the size of the market during the previous period. This expansion encompassed the growth in the pilot trading markets and a significant increase in the overall trading volume [25–29]. In 2015, Hubei and Chongqing pilot markets performed the first trades in the evolving China's carbon market, resulting in the participation of 400 more enterprises in the pilots compared with the number of participants in 2014. The Chinese Certified Emission Reduction (CCER) was adopted as a form of offsetting carbon emission quotas, and its registration system was officially launched in 2015. The seven pilots successively promulgated their respective management approaches for offsetting carbon. Because of differing provisions within each pilot relating to the CCER proportions allocated, project category, project source, method of reducing displacement output time, and offset limits, the CCER policy on market entry in the different pilots has entailed varying thresholds. In the pilot areas with less restrictive conditions for offsetting rules, such as Shanghai and Beijing, CCER trading performance is more apparent than it is in other provinces and cities. The CCER policy on market entry has promoted the mobility of the carbon market, but it has simultaneously resulted in a drop in market prices, with an evident decline in the quota price of each pilot market in 2015. Of these markets, the Shanghai market had the largest amount of CCER performance, with the greatest change in the carbon quota price. The daily and monthly average prices were lowest in Shanghai, at 9.5 CNY/ton and 15.52 CNY/ton, respectively. The involvement of a large number of institutional investors in the carbon trading market could further strengthen its vitality.

In addition to the existing seven carbon emissions trading centers, several domestic participants in the carbon market have begun to explore carbon trading mechanisms. For example, Beijing Environment Exchange and Shanghai Environment and Energy Exchange have launched services relating to carbon trading [25].

In recent years, the seven carbon trading pilots have experimented with different policy ideas and distribution methods [24]. They have introduced regulations and enterprises education and have implemented surveys on the data situation. Moreover, they have initiated transactions and performance assessments and have developed an offsetting mechanism.