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Editorial: Interactions between China's national emissions trading scheme and electricity market: Practices and policies

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Editorial on the Research Topic
Interactions between China's national emissions trading scheme and electricity market: Practices and policies

1 Introduction

Under the global climate governance and low carbon transition, building a carbon emissions trading market is the core initiative of countries around the world to use market mechanisms to promote greenhouse gas emissions reduction, as well as a prominent deployment to achieve its "Dual Carbon" in China (Chen et al.; Wang et al., 2022). The driving forward of China's Carbon Emission Trading Scheme (ETS) follows the principle of "walk before you can run", and the power sector, as the single sector with the most carbon emissions and the most basic and strategic industry in the national economy, has become the breakthrough point for the construction of a national ETS. However, as the market structure of electricity market is not yet perfect, and the construction of the ETS is at the initial exploration stage, whether the two market can each break through the institutional mechanism and optimize the implementation path becomes the basic premise of promoting the construction of ETS. In the meanwhile, both of them have strong correlation, whether the market mechanism and policy instruments between the two can be effectively connected and synergized determines the effectiveness of the construction of the ETS (Chi et al., 2022). Therefore, our Research Topic develops the role and influencing factors of ETS construction and the interaction between ETS and electricity markets, capturing the dynamic interaction and coupling between China's ETS construction and electricity markets, aiming to provide new empirical insights for a proper understanding of ETS and electricity market construction.

2 The role and influencing factors of emission trading scheme

ETS has been endowed with the function of controlling carbon emissions and promoting ecologically sound transformation. Most of the studies that have been conducted on the policy effects of ETS have focused on countries or regions with more developed market mechanisms, such as Europe and the United States. The research on China is mostly focused on the provincial level low carbon or economic growth perspective (Chen et al., 2022), but the scholars in this Research Topic have expanded on the subject matter. Shi et al., 2022 concentrated on the effect of ETS on changes in the generation mix of power producers. Solaymani used data from 1985 to 2019 to explore the impact of ETS on carbon dioxide generated by power plants using coal, oil and natural gas, and predicts the influence of the implementation of the ETS on carbon emissions from power plants between 2020 and 2030 based on the autoregressive distributed lag (ARDL) method, which provides a more micro-level perspective on the reaction of ETS on carbon reduction. Simultaneously, only by taking economic growth and carbon emission reduction into consideration can the transformation goal be fundamentally achieved (Fan et al., 2022), Chen et al. used a carbon trading pilot as a natural quasi-experiment to examine the outcome of ETS on carbon efficiency using data from Chinese prefecture-level cities. Shang and Xu proposed the Environmental Kuznets Hypothesis for Employment based on the Environmental Phillips Curve and Environmental Kuznets Curve, and empirically investigated the "double dividend" of low-carbon transition and employment growth brought about by ETS using the GMM approach.

As a necessary part of the environmental regulatory policy system, Carbon Emission Trading Scheme (ETS), like all environmental regulatory policies, act as a common pathway to reduce carbon emissions by forcing carbon emitters to actively engage in green and carbon-free technology innovation (Zhang et al., 2022a). Our Research Topic has been discussed in depth by scholars. Nie et al. studied the role of voluntary environmental regulation in promoting enterprise ecological innovation, and further explored the working way from three perspectives: government, residents and external enterprise. Chen et al., 2022 started with stakeholders of green and low-carbon technology, constructed a three-way game among enterprises, governments and residents, and simulated the optimal combination of tax, subsidy and publicity guidance. Energy-intensive industries are the next industries to be covered by the ETS. Exploring the benefits of enterprises in green innovation is conducive to a more thorough understanding of the driving force for the implementation of ETS. Xie et al. found that green innovation will inhibit enterprise value in the short term, and the negative impact is not significant in the long term.

As a policy-driven market, ETS is inevitably influenced by social, economic and carbon emission level characteristics. Scholars have conducted studies from multiple perspectives. At the policy level, Fu et al. explored the reaction on carbon emissions and the mechanisms of action from an economic policy uncertainty. Su et al. evaluated the role of state leaders which pay more attention on the green development on carbon intensity in different cities from Political Sensitivity. Huang et al. examined the impact of award and commendation policy of China's National Civilized City project on carbon emissions. At the societal level, Wu et al. verified the inverted "U-shaped" relationship between urban population spatial balance and carbon emissions. In terms of low carbon development, Xiang et al. assessed the evolution of non-polluting development in Fujian Province adapted to the entropy technique for order preference by similarity to ideal solution(TOPSIS) model in terms of economic, social, energy and environmental aspects. Similarly, Guo et al. explored the dynamic patterns of change in the level of re-electrification and the heterogeneity of regional development levels in China by using functional data analysis method.

3 Synergistic interaction between emissions trading scheme and electricity market

Accurately capturing the volatility trend of actual carbon prices and identifying potential risk transmission can ensure the smooth promotion of carbon emission reduction and facilitate green investment stimulation and government regulatory decisions. Chen et al. constructed a risk transmission framework for carbon trading, energy and commodities and find that two major shocks, the stock market crash and COVID-19, exacerbate systemic risk volatility. Du et al. explored the mechanisms influencing carbon prices from the perspectives of economic development, domestic and international markets, and climate change. They used a back propagation (BP) model to forecast Fujian's carbon prices based on daily frequency data from 9 January 2017 to 25 February 2022. Zhang et al. systematically illustrated the coupling relationship between electricity investment and carbon emissions and the regional heterogeneity, providing a theoretical basis for promoting carbon emission reduction and enterprise green investment.

As a market-based carbon pricing mechanism, the carbon cost will be transmitted to the end users, thus affecting the entire power system and economic cycle. At the macro level, Hu et al. calculated the marginal abatement cost for each country based on technological heterogeneity, using differences in national technology levels, and found that the cost for China is 1440. 183 US dollars/ton. Which gives countries along the "Belt and Road" a theoretical foundation for the creation of a regional

market for carbon emission trading program. At the micro level, Zhao et al. applied the contingent valuation method to investigate the cost of home without power in the end-use electricity market. From the perspective of system collaboration, Wang et al. employed particle swarm optimization and multi-objective particle swarm optimization approaches based on blockchain theory to simulate and examine the optimization path for the power system to meet both economic and green low-carbon constraints after the introduction of carbon emission constraints.

The ability of ETS to affect new decisions by supply and demand players in the power sector does not depend entirely on the construction of carbon markets itself, but also on the construction of markets such as electricity (Feng et al., 2021) In terms of price perspectives, Wang et al. showed that removing price distortions in coal, oil and diesel promotes carbon emission reductions, with this effect being most pronounced in the coal price sector, while Cai et al. analyzed the impact of industrial and business electricity price changes on macroeconomy, social output and price based on computable general equilibrium (CGE) model. At the market reform level, Long et al. found that the rebound effects on energy demand and carbon emissions from lower electricity prices due to electricity market reforms far outweigh the emission reduction effects from energy efficiency improvements. Liu et al. studied that market segmentation inhibits the efficiency of thermal power generation and that the negative effects can be mitigated by increasing the innovation effect. Liu et al. used the Lerner index to measure grid market power and demonstrated that the abuse of grid market power leads to reduced electricity reliability, which provides a theoretical basis for electricity market reform. In terms of market regulation. Jin et al. firstly constructed a bank performance guarantee model by introducing banks in the role of guarantors with power generators and power sellers, then analyzed the risk prevention mechanism of financial intervention in the power market. Jin et al. also constructed an internal and external monitoring model based on evolutionary game theory, and found that both internal and external monitoring agencies have an incentive to collude. Hence the need for third parties to ensure independence and internal regulators to ensure that rights are locked in a cage.

Our Research Topic's insights offer a theoretical and empirical foundation for capturing the interaction between the ETS and the power market, turning ETS into a workable and efficient method of decarbonizing the electricity sector, as well as providing new inspiration for countries like China where the development of the electricity and carbon markets is still in its infancy.

Author contributions

XY was responsible for investigation and writing.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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