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The Synergy Mechanism of Promoting Renewable Energy Consumption in China

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Abstract

With the improvement of environmental requirements, promoting renewable energy consumption has become a key. From the energy policy coordination point, this paper defined the concept of energy policy, and took price policy as center to design the synergy mechanism of carbon emissions trading, carbon tax, subsidy policy, price policy based on principles of departments collaboration, market dominant and orderly progress. The mechanism will make environmental benefits internalization of renewable energy, and gradually straighten out the energy prices mechanism, and provide a reference for setting renewable energy consumptive policy.

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Keywords: Renewable energy; Carbon emissions trading; Carbon tax; Subsidy policy; Price policy; Synergy mechanism

1. Overview

With the rapid development of economy, China's energy demand continues to increase and environmental pollution is more and more serious. In order to relieve environmental pressure, promoting renewable energy development has no time to delay, and energy policy is closely related to energy development [1-3]. In recent years, the research on energy policy mainly concentrated in a single policy research [4-7], and various types of energy policies are different from departments and implementation objectives. Therefore, it is lack of synergy among energy policies. With the development needs of renewable energy, the synergy mechanism of energy policy has become urgent demand.

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Nomenclature

R	remaining of the whole society	C	remaining of consumer
S	remaining of producer	O	remaining of society
G	remaining of government	P_1^*	equilibrium price of coal
P_2^*	equilibrium price of oil	P_3^*	equilibrium price of natural gas
P_4^*	equilibrium price of thermal power	$P_{5,t}^*$	equilibrium price of renewable energy
T^*	equilibrium carbon tax rate	P_r^*	equilibrium carbon price of carbon emission trading
B^*	equilibrium unit subsidy	C_{na}	CO ₂ emissions cost of n-th energy
E_n	the total CO ₂ emissions of n-th energy	T	carbon tax rate
η_n	carbon content ratio of n-th energy	P_r	carbon price of carbon emission trading
$i = \{1, 2, 3, 4, 5\}$; 1 coal; 2 oil; 3 natural gas; 4 thermal power; 5 renewable energy			
B_2	unit renewable energy subsidy excess CCER	a_{CO_2}	unit governance cost
q_{CO_2}	unit renewable energy CO ₂ emission reduction compared with fossil energy		
B_o	unit renewable energy subsidy of pollutant reduction except CO ₂		
P_e	desulfurization, denitration and dust of coal-fired power price		
P_b	thermal power benchmark price	Q_n	consumption of n-th energy
P_n	price of n-th energy	d	influence coefficient of customer demands price compared with its rival
U_n	heat value of n-th energy	π_n	profit of n-th energy
C_{nf}	fix cost of n-th energy	C_{nv}	variable cost of n-th energy
θ_1	CO ₂ emission of unit coal	θ_2	CO ₂ emission of unit oil
θ_3	CO ₂ emission of unit natural gas	θ_4	CO ₂ emission of unit thermal power
M	the average CO ₂ emission price under carbon tax and carbon emission trading		
N	environmental value of unit renewable energy	Q_{total}	the whole society total energy consumption
w_1	proportion of carbon emissions trading quotas in total quotas		
w_2	proportion of CCER in CO ₂ emission reductions of renewable energy		

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