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The Synergy Mechanism of Promoting Renewable Energy Consumption in China

Yongxiu He[a,*], Yuexia Pang[a], Han Shu[a]

[a]*School of Economics and Management, North China Electric Power University, Zhu Xin Zhuang, Bei Nong Road No. 2, Changping District,Beijing 102206, China*

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.

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.

* Corresponding author. Tel.: +86 (0)10 61773113; fax: +86 (0)10 61773311.
*E-mail address:*yongxiuhe@126.com （Y. He）. pangyuexia@sina.com (Y. Pang). tmkad2014@sina.com (H.Shu).

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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