

Rural Energy Eco-compensation Policy Design in China

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Abstract. Analyzed the status quo of rural energy use, pointed out the direction of sustainable development of rural energy, constructed a preliminary system of rural energy eco-compensation framework based on the significant social and ecological benefits of the rural sustainable energy system, and pointed out that the rural energy eco-compensation should be gradually transformed from the administrative compensation to market compensation. The findings enriched the connotation of eco-compensation, and can provide a useful reference for rural energy planning and construction.

Introduction

With the rapid development of economy and society, the demand for energy is growing in rural areas in China. Under the background of the ecological environment worsening and global energy shortage, it is almost impossible to meet the rural energy demand by increasing the supply of primary fossil energy. So, taking measures to use clean energy adapted to local conditions is an important way to meet the energy needs of rural areas. Rural areas have abundant biomass resources, and it has the remarkable social efficiency and ecological environmental benefits to develop the rural biomass energy as the alternative of fossil energy.

However, the construction of rural energy is facing many difficulties at present, foremost of which is the shortage of funds. On the basis of ecological and environmental benefits, we put forward eco-compensation mechanism preliminarily between urban industrial enterprises and rural energy enterprises. This mechanism not only can soften the carbon emission constraints of urban industrial enterprises but also can provide valuable financial support for rural energy.

Current researches on issues of ecological compensation research mainly focused on land, forests, rivers, mines, etc[1-8]. Also some scholars studied the legal basis for the ecological compensation [9]. The combination of ecological compensation and carbon emissions trading pioneered a new field in the research of ecological compensation [10,11]. From the existing literature, research related to energy ecological compensation is rare, and studies on rural energy and ecological compensation is even rarer.

Present situation and the transforming of rural energy consumption patterns

Fossil energy has already supported the development of human beings before and in the 20th centuries; however, fossil energy has also caused catastrophic damage to the environment. Moreover, the inventory of fossil fuels is limited, and insufficient to meet the infinite development needs of human beings. According to the international energy agency (IEO) and the United States geological survey (USGS), the available-for-use time of oil, gas and coal are as shown in table1.

Table 1 Fossil energy share of global energy consumption and available-for-use time

Types of energy		share of global energy consumption		available-for-use time
fossil energy	coal	23.4%	79.6%	90
	oil	21.2%		53
	natural gas	35.0%		63

For a long time, fossil energy with high pollution has been dominant in China's energy consumption structure, and coal, oil, natural gas is relatively inadequate. Coal, oil and natural gas reserves per capita are only 56.3%, 7.7% and 7.1% of the world average. By 2015 and 2020, China's oil net import rate will reach 57.4% and 57.4%, more than the limit of oil security.

At the same time, the demand for high-grade energy in rural areas is increasing. However, under the circumstance of energy shortage and the ecological deterioration, the incremental energy demand in rural areas cannot be solved by increasing the supply of fossil energy.

There are a large number of biomass resources in rural areas, which have always been discarded and caused great waste of resources and serious environmental pollution. It is well known that biomass energy is a kind of clean energy, which will not cause environmental pollution in theory. Therefore, it not only can solve the energy shortage problem in rural areas, but also can save resources to protect the ecological environment if these waste biomass resources are made an energy-oriented use of. That is to say, biomass energy is the sustainable development direction of rural energy.

Analysis of ecological benefits of rural biomass energy

Rural ecological benefit can be measured by reducing emissions which produced in the biomass energy as an alternative of fossil energy. Coal accounts for roughly 80% of the fossil energy used currently in China. Therefore, this paper analyzes the ecological benefits of biomass energy in rural areas by comparing the coal.

Coal burning produces sulfur dioxide, nitrogen oxides, TSP and solid waste. Sulphur dioxide is the important cause of respiratory diseases, as well as causing acid rain. The desulfurization equipment almost couldn't found in China rural area. Nitrogen oxide and TSP are important atmospheric pollutants. According to the related research, the emission factors of nitrogen oxides and TSP are 1.88 g/kg, and 1.3 g/kg, respectively. Estimation results showed that nitrogen oxide and TSP emissions from the burning of coal reached 932000 tons and 644400 tons respectively in China's rural area in 2004. Nitrogen oxide and TSP coming from the burning of coal have been showing a rapid growth trend in China's rural areas in recent years. After burning, coal produces large amounts of solid wastes. Estimation results indicate that in 2012 solid waste generated from coal consumption in China's rural has reached 184.85 million tons.

As we all know, biomass energy is one kind of "zero-emission" energy in theory, and does not pollute the environment. Thus, if the biomass energy replaces traditional fossil fuels, enormous ecological benefits will be released.

Rural energy eco-compensation mechanism

Currently, the issues of energy-oriented use, scale and industrialization development of biomass resource have been explored at home and abroad. The potential of energy-oriented development of biomass resource in China is enormous. However, five obstacles in the respects of cost, market, policy, technology and capital hinder the development. In these five big obstacles, a shortage of funds is particularly prominent.

Sources of funds for construction of rural biomass energy can have a variety of channels. Money can be from the country's rural energy construction special fund and other funds for supporting agriculture, but this part of the money is not enough. some funds may come from bank loans, but the bank loan interest will make rural biomass energy companies cannot afford, because t these low-profit enterprises

are semi-public nature. Based on rural biomass energy reduction benefits, carrying out the carbon emissions trading is a feasible way to raise rural biomass energy development fund.

According to the different classification standards eco-compensation can be divided into different categories. According to the running machine, eco-compensation can be divided into administrative compensation and market compensation. According to the nature of the recipient, eco-compensation can be divided into monetary compensation, physical compensation, and governance compensation, etc. According to the parties' status, eco-compensation can be divided into longitudinal and transverse compensation^[12].

The factors, such as characteristics of rural energy, feasibility of compensation, etc. should be considered while constructing the ways of rural energy eco-compensation. This study suggests that rural energy compensation should integrate administrative compensation and market compensation. Rural energy eco-compensation system is shown in Fig.1

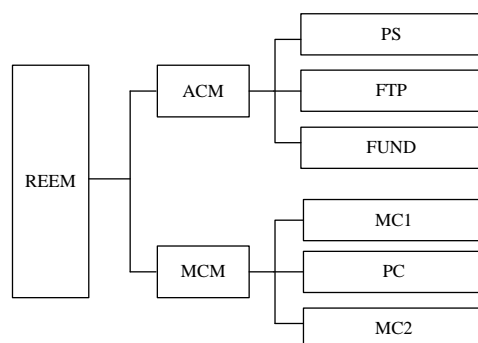


Fig.1 Rural energy eco-compensation mode

Acronyms description : REEM, Rural energy eco-compensation mode; ACM, Administrative compensation mode; MCM, market compensation mode; PS, Policy support; FTP, Fiscal transfer payment; MC1, Monetary compensation; PC, Physical compensation; MC2, Mental compensation.

For many years, the Chinese government has attached great importance to rural energy construction, put a huge financial focusing on supporting rural biogas, and has also made a big success. Given the importance of the rural biogas and the characteristics of the low carbon environmental protection, the Chinese government can consider going further with intensifying policy support, increasing the proportion of fiscal transfer payment, and gradually establishing the rural energy eco-compensation fund.

In view of the shortage of funds for rural energy development, the government should actively support and push the implementation of the market compensation. Market compensation is the most important financial compensation, whose main form is a carbon emission trading. In addition, the government should also actively promote the physical and mental compensations in order that the rural energy can gradually become bigger and stronger.

At present, the administrative compensation is given priority to, and the market compensation is still in the preliminary exploration stage. With the eco-compensation mechanism mature and improve, the government should actively promote eco-compensation marketization, and gradually increase the market share of compensation.

Conclusions

Rural energy is the material base of the economic and social development in rural areas. This paper presents a preliminary design of rural energy eco-compensation, and points out that the rural energy compensation should be from the current administrative compensation gradually to market compensation.

For rural energy eco-compensation, there are still many problems need to study, such as the efficiency of the rural energy, the main body of rural energy eco-compensation, eco-compensation

standard, as well as the eco-compensation channels and so on. These issues will be gradually resolved in future studies

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