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Energy Procedia 5 (2011) 1998–2002

Energy

**Procedia**

IACEED2010

# Constructing Energy Saving System Based on Low-carbon Economy

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## Abstract

Constructing a comprehensive energy-saving system is an effective way to meet the development of global low-carbon economy, energy crisis and the deterioration of ecological environment. In this paper, we made an analysis and evaluation to the practical urgency and constraints of energy-saving system construction with system analysis, combining with our low-carbon economy and the fact of energy saving, we construct a model of energy saving system based on energy, economy and environment in China. Then we put forward some ideas that the way to construct energy-saving system on the perspective of energy supply, energy consumption and the ecological environment based on the model.

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Selection and peer-review under responsibility of RIUDS

*Key words:* Energy; Energy-saving system; Low-carbon economy

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## 1. Introduction

The development of low-carbon economy is helpful for solving the crisis of global warming and energy security, the Kyoto Protocol and the Copenhagen agreements issued an "energy saving" and "low-carbon economy" mandatory and moral initiative around the world. China, as the second carbon emitting country in the world, how to change the traditional development model of "pollution first, treatment later" to the "low carbon" development path has become a salient focus of concern at the stage of the transformation of China's economy development way. Constructing an energy-saving system is the fundamental way to use energy effectively and response to low-carbon economy development effectively. We try to study the construction of energy-saving system so as to achieve the goal of promoting the development of low-carbon economy and energy saving strategy.

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## 2. The urgency of energy-saving system construction

First point, it is necessary to fast construct an effective energy-saving system to cope with the development of global low carbon economy. Developed countries actively promote the low carbon economy and begin to adopt carbon tariff as green trade barrier. For example, The USA and France both ready to levy carbon tariffs and gradually increasing from foreign enterprises who have not taken measures to protect environment during their production [1]. With the development of global low carbon economy, perfectly constructing energy-saving system to enhance the efficiency of energy utilization has become a necessary way to cope with the global "low carbon" competition effectively.

Second point, the gap of energy supply and demand is becoming larger, which requires to building an energy-saving system as soon as possible. In recent years, the demand of energy is increasing faster than before. The energy shortage is a severe challenge to industrial structure optimization and national economic security during the process of industrialization. In the existing energy consumption structure, coal occupies more than 70% of the total is why there are more discharge and more pollution in process of the industrialization [2]. Which means that constructing an energy-saving system and ascending coal efficiency is an effective way to narrow the gap of energy supply and demand.

Third point, the weak ecological energy-capacity requires constructing and perfecting our energy-saving system [3]. From figure 1, we can see that per capita ecological footprint  $ef$  increases significantly these years, but the supply of per capita ecological footprint  $ec$  is slowly increasing, the gap between them is larger and larger. The urgency of high energy consumption and high pollution will further weakening China's energy ecological carrying capacity [4].

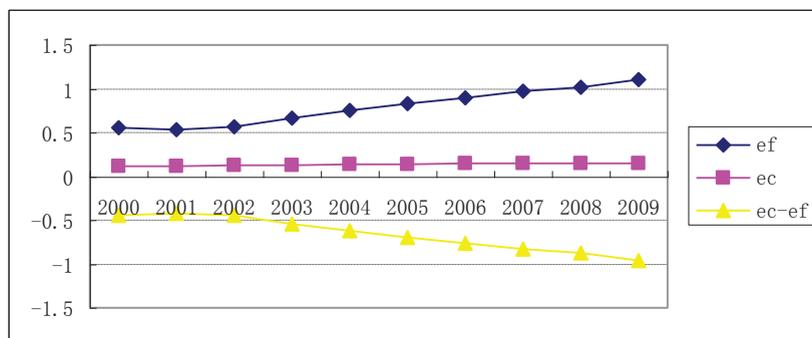


Figure 1: The growth trend of China's per capita energy ecological deficit, 2000-2009. (Unit:  $hm^2$ ): Data sources: according to China statistics 2010, previous forest census statistics data sorting.

## 3. Analysis to the restriction factors of energy saving-system construction

First, China's per capita energy consumption is improving quickly, but the public awareness of energy-saving is relatively backward these years. Energy consumption in China has been increasing much, and the corresponding propaganda and education is relatively backward. Energy waste almost becomes normal phenomenon from family to organs in our country, in order to "putting on the dog", some enterprises and institutions keep lights shine and computers open almost 24 hours everyday; to embody their "high quality" service, some enterprises and institutions make air condition ultra-low refrigeration, excessive heating in the luxurious buildings, trains or cars and so on. According to China energy statistics yearbook 2010, from 2000 to 2009, China's per capita energy consumption increased from 1148 to 2297

kilograms standard coal [5]. The public have not known about the finance and tax preference, skills, techniques and methods to build energy-saving system from the governments' guidance.

Second, China's legal norms of energy-saving are not sound. The detailed and practical operability of some law such as environmental protection, mineral resources, the coal law and the electricity law are not enough to meet the fact. We lack a comprehensive energy law and the act of carbon emissions control and exchange for the development of low carbon economic. Without this we can't take effective measures to deal with many major pollution accident disputes.

Third, the economic incentive mechanism of energy-saving is not sound. These years, we use more compulsory orders to implement the policies of energy-saving than effective economy measures, Taxes are mainly directed to enterprises' income gained from the natural resources, which become local fiscal revenue but not an effective economic mechanism. Lacking effective ecological compensation mechanism is an important reason that our ecological environments become worse. Once these areas that provide their ecological resources can't gain reasonable charge, they will lose enthusiasm and activeness to protect and save ecological resources [6].

Fourth, the dominant restricted factor to constructing energy saving system is the leading industries of "high carbon" in industrial structure. The reason that China has become the second largest carbon emitter and energy consumption country in the world is "high carbon" industry being dominant in the industrial structure. In 2009, these industries with high energy consumption and heavier pollution, such as electric power, iron and steel, non-ferrous metal, chemical industry, cement, building materials, automobile and so on consumed 70% energy of the total consumption, and among which, more than 70% energy come from coal with higher emissions. More seriously, the characteristic of "high carbon" industry in the industrial chain of network bring more severe pressure to the construction of energy-saving system.

Fifth, the industrialization of energy-saving service is just in initial stage in China. At present, the development of energy-saving service industry is difficult to meet low-carbon economy and energy saving system construction. The support policy of energy saving such as fiscal, taxation is mainly aimed at the units of energy-using, Energy-saving service enterprises almost gain non policy support. And they almost cannot obtain funds support from financing markets, which leads to many energy saving projects hard to being developed. In addition, the energy-saving service enterprises will pay higher taxes for their energy saving equipment assets, and the heavier tax enhances the market entry threshold of enterprises.

#### **4. Countermeasures to constructing energy-saving system based on the development of low-carbon economy**

It is necessary to construct an effective energy-saving system to improve energy-using efficiency, and we should construct an energy-saving system model (figure 2) based on energy, ecological environment and economy development to optimize our energy supply, industry development, ecological environment protection, and other aspects of energy-saving system.

##### *4.1 Constructing an effective energy-saving system on the perspective of energy supplies*

Constructing an energy-saving system on the perspective of energy supplies is to increase energy utilization efficiency, to optimize energy structure, to exploit and utilize new energy actively by technology innovation. Meanwhile, we should speed up the optimization of thermal power industry structure and the ability of technical innovation. To speed up the development of new energy such as hydroelectric, solar energy, wind energy, biomass energy, ocean energy and so on to alleviate thermal power's dominant situation. We should learn the experience of the advanced technology of energy conservation and new energy development and utilization from developed countries, especially from the

United States and Japan. Japan has successfully introduced "sunshine project", "moonlight planning" and "new sunlight plan" from 1974, use legal, finance, taxation and other multi-means to develop and utilize solar, geothermal, wind power, methane, tidal power and other new energy to save energy.

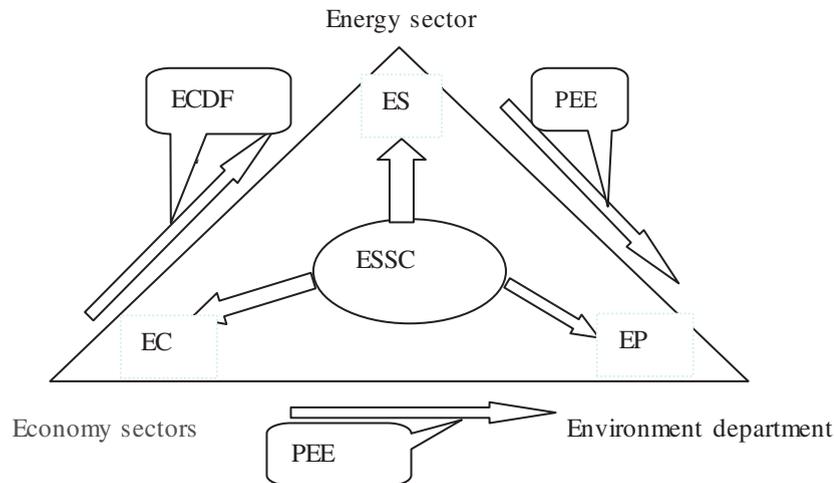


Figure 2: energy-saving system model based on energy, environment and economy

Note: ESSC: Energy saving system construction; ES: Energy supply; EC: Energy consumption; EP: Ecological and environmental protection; ECDF: Energy consumption driving force; PEE: The pressure on ecological environment.

#### 4.2 Constructing an effective energy-saving system on the perspective of energy consumption

It is important but difficult to save energy on the perspective of energy consumption. First, government should take effective measures to encourage enterprises that belong to high-carbon industry to raise their energy-saving efficiency fundamentally by scientific and technological innovation. Second, optimizing and upgrading industry structure to raise energy-saving efficiency. We should actively develop these industries with less resources consumption, lower environment pollution and larger market potential, and the characteristics of these industries are higher technical content, more potential development, intensive intelligence and lower-carbon. In recent years, under the background of low-carbon economy, developed countries have begun to transfer their high-carbon industries to developing countries. China must firmly establish energy-saving consciousness and the concept of low-carbon economy development, enhancing admittance threshold of high-carbon industry, constantly optimize our industrial structure and the investment structure. Third, perfect the incentive mechanisms of energy-saving. Promote incentive mechanism reform of energy-saving including the government provides taxation relief, duty privilege, financial subsidies and other appropriate policies to these enterprises with good effect of energy saving. Establish and perfect the compensation mechanism of ecology environment. Adopt restrictive tax policy to regulate these behaviors of wasting resources, and give properly preferential tax rate to these enterprises with high efficiency of energy utilization. Fourth, promote the development of energy-saving service industry actively. Perfect the market mechanism of energy-saving service industry, Cultivate the market-oriented operation mode of energy-saving service industry market. Government should provide effective preferential policies including taxation, subsidies, finance to help energy-saving service industry to overcome the difficulties in development. And at the same time, professional energy-saving service

enterprises should actively cultivate their market Competitiveness by professional energy-saving technology, management efficiency, brand construction and service quality.

#### *4.3 Constructing an effective energy-saving system on the perspective of low-carbon economy*

It is important to cultivate and advocate a low-carbon lifestyle to save energy from detail consideration in our daily life. First, We should change the traditional abstraction "mission" way with concept and cut-scenes type to help people have comprehensive and clear understanding about the knowledge of energy saving and low-carbon economy development. We can make full use of media reports and films, television, cartoon etc to propaganda low-carbon economy, energy-saving technology. Government should advocate energy saving and low-carbon lifestyle by flexible economic incentive mechanism, for example, conduct tax-cut and subsidies to these people who buy energy-saving auto, new energy-saving building and equipment. It is very important that the central and local governments at all levels should establish and perfect the energy consumption assessment system to be energy saving models.

Second, we should perfect energy-saving law more detailed, and make them to be more maneuverable. As soon as possible, lay down a basic law of energy to unify energy-saving and low-carbon economy law, on the basis of energy law. We should focus on revising existing energy-saving law to increase their maneuverability. It is necessary to perfect the carbon emissions trading market and the licensing system, according to the national and regional energy ecological carrying capacity formulation and distribution of carbon emissions index. We should scientifically formulate energy-using products, equipment of power-consumption standard and energy saving design specification. Make detailed regulations of energy-saving criteria to energy-consuming industry.

Third, pay high attention to the technology innovation of energy saving. Technology innovation is the fundamental guarantee of energy efficiency. However, the cost of energy-saving technology innovation is too much, without governments' support, energy-saving technology innovation will be too difficult. The government should support high efficiency energy saving, new energy development, clean energy supply technical innovation by subsidies and tax breaks; we should strengthen consummation and cooperation with the developed countries to perfect our energy-saving system.

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