



Efficient saving targets of electricity and energy for regions in China

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ARTICLE INFO

Article history:

Received 18 December 2007

Accepted 1 January 2011

Available online 11 April 2011

Keywords:

Sustainable development

Data envelopment analysis

Energy consumption

ABSTRACT

This paper computes the three major types of efficient electricity, coal, and gasoline oil savings for 27 regions in China during the period 2000–2003. The data envelopment analysis (DEA) with a single output (real GDP) and five inputs (labor, real capital stock, coal consumption, gasoline oil consumption, and electricity consumption) is used to compute the energy-saving targets of each region for each year. The efficient energy-saving ratios of each region in each year are obtained by comparing the actual energy inputs to target energy inputs. Our major findings are as follows: 1. The east area contains most of the efficient regions with respect to the three major types of energy in every year during the research period. 2. The east, central, and west areas have 2000–2003 average target saving ratios of coal consumption at 18.58%, 44.00%, and 59.80%, gasoline consumption at 13.43%, 22.70%, and 45.04%, and electricity consumption at 8.55%, 16.42%, and 43.70%, respectively. 3. Compared to the cases of gasoline oil and electricity, coal consumption saving is China's most urgent task.

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1. Introduction

Energy changes and transformations make things happen. We buy energy, sell energy, eat energy, waste energy, talk a bit about conserving energy, and fight over energy. Energy, a motive force of economic activity, includes all natural resources that can be used after refining. International Energy Outlook [20] predicts that world energy consumption will increase by 60% from 1999 to 2020. Energy demand in developing Asia is projected to more than double by 2020.

Overusing energy will cause energy shortages, energy crisis, the price of energy to go up, and environment pollution. Production costs of energy rise, and this raises manufacturing costs. For the consumer, the price of energy goes higher, leading to reduced consumer confidence and spending, higher transportation costs, and general price increases. In particular, environment pollution endangers an organism's health and life indirectly through the food chain. Therefore, energy saving has been a crucial issue for sustainable development. Before new and substitute fuels become available, energy saving is a must in order to make economic growth possible.

The causes of rapid Asian economic growth and its sustainability have generated considerable debates since the early 1990s (e.g., [2,4,10,24–27,40,43,44]). China, India, and other developing countries are considered the largest energy consumers and are also the

largest emitters of greenhouse gases. As such, they should be involved in the efforts to solve these global problems [21].

China has abundant energy mines, but the per capita usable volume of energy is relatively low. Kambara [23] and Dorian [9] showed that the aggregate demand for energy increased correspondingly, yet the aggregate supply of energy was relatively insufficient. The inefficient energy use results from uneven mineral distribution, unbalanced regional development, and insufficient infrastructure. In order to satisfy sustainable economic development, social advancement, population growth, and increased energy demand, the energy supply must suffice the energy demand. Therefore, how to guarantee steady energy sources forms the energy topics in security, diplomacy, and trade [38].

China's energy consumption accounts for approximately 58% of East Asia's (excluding Japan) total energy consumption. All forms of energy are on the increase, and as result energy demand and use are both up. This paper presents the consumption status of the three main types of energy in China: coal, oil, and electricity. In order to avoid repeated calculation, this paper only regarded final consumptions as energy inputs.

First, coal use steadily increased in China until 1995, then declined for a few years, but now continues to rise. Coal consumption in China makes up 70% of energy use and China is the biggest consumer and producer of coal in the world. The development and production of the coal industry has provided stability in China's economic growth, but since 1949, China has suffered mostly from a shortage of coal. China's coal consumption in 2003 was 1.64 billion tons, but total coal available for consumption was 1.58 billion

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