

Topics: Electricity Market in Asia

Title: An analysis of electricity supply costs in Japan with an option of low-grade coal utilization

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Overview

The purpose of this study is to evaluate the importance of low-grade coal, which has features of stable-prices and plenty resources, in the electricity supply system in Japan. For that purpose, the authors researched the data of low-grade coal such as the quantity of resources as well as the utilization technologies including dry process. The authors conducted time-series analysis of low-grade coal prices as well as the prices of the other fossil fuels such as oil, natural gas, and high-grade coal. The authors plan to analyze the costs of electricity supply in Japan under scenarios with and without introduction of low-grade coal in the future.

Methods

The authors summarize the data of resources of coal including bituminous coal including anthracite, sub-bituminous coal, and lignite 1) 2). The authors conduct the time-series analysis among coal prices and the other fossil fuels using the data in the U.S. (Fig.1) 3). The authors develop an optimal electricity supply model in Japan. Using the analyzed data of fossils and the developed model, the authors calculates not only the maximum likelihood values but also the distribution of electricity prices. The electricity supply model includes technologies that utilize low-grade coal such as drying process. In the drying process the lignite (with 60% moisture) is dried to the coal with 15% moisture that is equivalent to the water-content of typical sub-bituminous.

Expected results

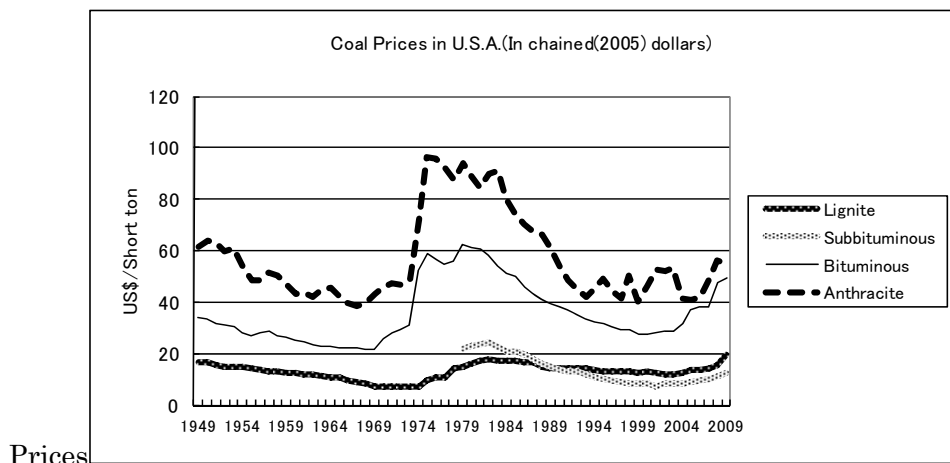
The expected reserves of coal in the world were 3.4 trillion tons in 2002 and 1.55 trillion tons for bituminous including anthracite, 0.75 trillion tons for sub-bituminous, and 1.06 trillion tons for lignite.

Fig. 2 shows the average and the distribution of the coal prices. The author plans to analyze the correlation coefficient between the coals and the other fossils and prepare for the analysis using an optimal electricity supply model.

Using correlations of the prices among fossil fuels and the optimal electrify supply model, the authors calculate the maximum likelihood values but also the distribution of electricity prices in several cases such as natural-gas-power-dominant-case and lignite-available-case. The lignite-available-case would be one option that realizes the low average price and low distribution of electricity prices. In addition, the authors search for the best mixture options that realize the lowest average price and lowest distribution of electricity prices.

References

- 1) JCOAL (Coal Energy Center), Call Note 1993 edition, 2004 edition, and 2008 edition
- 2) World Energy Council, Survey of Energy Resources, 1992, 2004, 2007
- 3) U.S. EIA (Energy Information-Administration), Energy Review 7.8 Coal



Prices

Fig. 1 Coal prices in U.S.A.

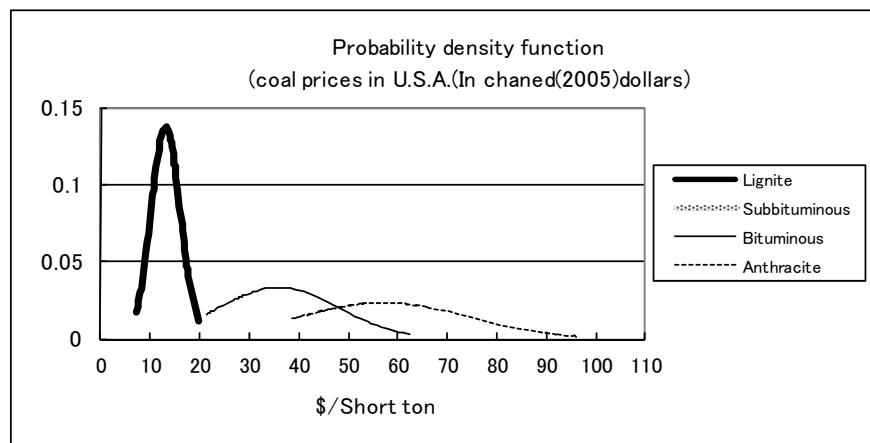


Fig. 1 Probability density functions of coal.