

The Fuzzy ANP and FCE Based Techniques for Evaluation and Classification of Coal Suppliers for Sea Port Enterprises

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Abstract

Coal suppliers are the sources of coal transaction, and the port enterprises' scientific evaluation of the large number of upstream coal suppliers is the essential foundation for their own development and the stability of coal transaction. The aim of this paper is to evaluate and classify the coal suppliers from the perspective of sea port enterprises. The evaluation criteria are proposed by factor analysis. An integrated fuzzy analytic network process (FANP) and fuzzy comprehensive evaluation (FCE) method is developed and used to evaluate and classify the six coal suppliers of Jin-Ji ports group. Herein, FANP is employed to determine the weight of criteria proposed by factor analysis and the coal suppliers are evaluated and classified by FCE. Finally, a sensitivity analysis is carried out to testify the stability and robustness of the method. The research results demonstrates that "basic capability" and "development potential" are relatively important when evaluating coal suppliers and based on these two factors, the suppliers are categorized into four classes: collaborative, cooperative, enhanced and available. Moreover, the method is able to evaluate coal suppliers with high evaluation robustness, which therefor may serve as a reference for other industries in real world decision.

Keywords: Fuzzy ANP, fuzzy comprehensive evaluation, coal suppliers, evaluation & classification, factor analysis, sensitivity analysis.

1. Introduction

Coal, as China's major energy, is an important component of the national economy and at the core of any other resources. According to the China National Bureau of Statistics, the resource production of coal, crude oil and natural gas are 36.8Mt, 2.15Mt and 1350CBM respectively whose feature is rich coal, lack oil and miss gas. This condition determines coal accounts for 70% of energy consumption in China and it will not be 50% until 2050 according to the forecast by authority organizations. However, the inverse distribution of supply and demand (About 90.29% of the coal is mined in the western provinces of Shanxi and Shanxi and the northwestern region of Inner Mongolia,