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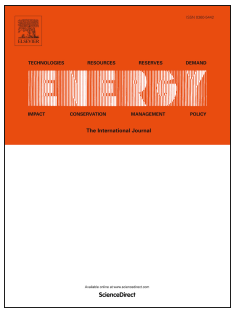

A novel self-adapting intelligent grey model for forecasting China's natural-gas demand

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A novel self-adapting intelligent grey model for forecasting China's natural-gas demand

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Abstract: Natural gas plays an important role in China's sustainable economic development, and its demand is expected to increase its proportion in energy mix in the future. The aim of this present paper is to evaluate the future demand of natural gas in China, based on the historical data that is characterized by uncertainty and sparsity. To this end, a self-adapting grey prediction model having a nonlinear optimized initial value has been designed to intelligently adapt to features of natural-gas consumption. The new initial value in the modified model has the advantage of an adjustable weighted coefficient in each component of the accumulated sequences, which performs better than the previous initial values that have a fixed structure and poor adaptability to the volatility series. Moreover, to achieve high accuracy, the generating parameters in the new initial value can be optimally determined by utilizing an ant lion optimizer (ALO) algorithm. To demonstrate its efficacy and practicality, this new model is implemented to fit and forecast China's natural-gas consumption from 2002 to 2014 in comparison with a range of benchmark models. The experimental results indicated that the fitted and predicted performance of the new model is better than those of the competitors. Therefore, the novel self-adapting intelligent model is employed to predict China's natural gas demands from 2015 to 2020. The forecasted result shows that China's natural gas demand will reach more than 340 billion m^3 in 2020, which is consistent with those presented by other international professional agencies and researchers in recent years. Ultimately, according to the predicted results, relevant natural gas suggestions are proposed for decision-makers.

Keywords: Grey prediction model; Nonlinear optimized initial value; Ant Lion Optimizer; Natural-gas consumption prediction.

1 Introduction

China has become the largest developing country in the world and has experienced rapid economic and social development since initiating market reforms in 1978. GDP growth has averaged nearly 10 percent a year, the fastest sustained expansion by a major economy in history [1]. Its continuous economic development over years has hugely boosted the demand for primary energy (namely, coal, oil, and natural gas), making China the globe's largest energy consumer since 2010 [2]. In 2015, the national shares of oil, natural gas and coal accounted for approximately 18.1%, 5.9% and 64.0% of the energy mix, respectively [3]. This situation illustrates that fossil energy sources still