[PAPER/POSTER TITLE]

THE CONGESTION PRICE OF NATURAL GAS PIPELINE TRANSMISSION NETWORK: MULTI-AGENT MODELING AND EMPIRICAL

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Overview

In recent years, the proportion of China's natural gas consumption in the primary energy structure has continued to rise, and the gap between the supply and demand of natural gas is increasing. But the natural gas pipeline infrastructure construction in China started late, and the scarcity of natural gas pipeline resources led to congestion in the pipeline network. Congestion caused a mismatch in natural gas market resources and the distortion of natural gas prices. This paper uses mixed complementary problem model to simulate the natural gas pipeline network in Shandong Province through multi-agent modeling. The model data set contains 6 gas fields , the 16 main city of Shandong Province and the 3 Oil and gas companies. We use GAMS software to calculate the shadow price of pipeline network resources , to compare the situation of third-party access and no third-party access scenarios under natural gas pipeline congestion. We find that the congestion price of pipe network without third-party access is higher than the congested price of third-party access. And the natural gas pipeline network congestion in Shandong Province varies from region to region. The pipeline connecting the end of the pipeline is often more congested; the more outflows of natural gas from urban nodes are often more congested.

Methods

This paper uses the mixed complementary problem to simulate the Nash equilibrium of the natural gas market. Since the natural gas market involves multiple market players, under Nash equilibrium, each market entity is required to optimize its own objective function and to node the research targets, including producers, transporters, and consumer markets. Under the complementary equilibrium conditions, through GAMS software to calculate the shadow prices of pipeline network resources, to compare the situation of third-party access and no third-party access scenarios under natural gas pipeline congestion.

Results

1.the congestion price of pipe network without third-party access is higher than the congested price of third-party access.

2. The congestion value in the third-party access context is less than the value without third-party access.

3. Congestion will lead to a reduction in upstream equilibrium production and downstream balanced consumption.

Conclusions

When there is an independent pipeline operator, the operator can integrate and optimize the natural gas flow according to the natural gas pipeline transportation situation in the province, so that the natural gas transport effect can be greatly optimized, and the natural gas resources can be fully utilized, which is beneficial to the upstream gas field. Effective integration with the downstream consumer market. Response In the aspect of price, there is no distortion of the market price of natural gas that cannot be accessed by third parties. It cannot truly reflect the relationship between supply and demand in society. If congestion costs are included in the pricing mechanism of natural gas, the internalization of congestion costs can reduce the degree of congestion.

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