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Equivalent Optimal Power Flow Method Considering Natural Gas Network Constraints

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Abstract: Electricity and natural gas networks are owned by different utilities with multiple decision-makers in many countries. Apparently, the centralized energy flow optimization is only suitable for a single decision-maker. This paper presents an equivalent optimal power flow method for electricity and natural gas networks with multiple decision-makers. This method proposes a constraint equivalent model for the natural gas network considering the limits of gas sources, nodal gas pressures, and compressor pressure ratios. Based on the constraint equivalent model, the equivalent optimal power flow method can be constructed further. This method can retain the impacts of natural gas network constraints on the electricity network and ensure the security of the electricity network. The effectiveness of the proposed method is demonstrated with a set of test results on an electricity and natural gas coupled system composed of the IEEE 14-bus system and a 10-node gas network.

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