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Day-ahead Bidding Strategy of Integrated Energy Service Provider Based on Electricity - Gas Joint Market Clearing

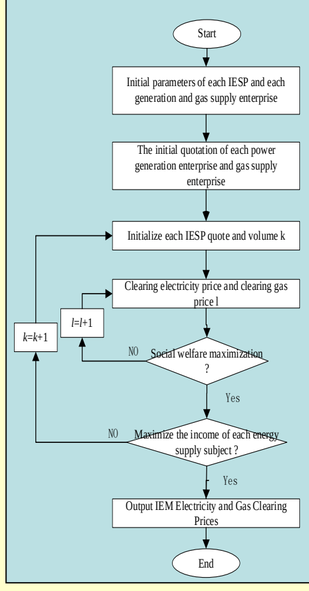
Xun Dou, Miao Zhu, Donglou Fan
College of Electrical Engineering and Control Science，
Nanjing TECH University

Sub title

Firstly, the optimal bidding model and retail price model of IESP are established by considering the mid-long term demand response behavior of users and the energy decomposition of medium and long-term market and spot market. Secondly, an integrated energy market trading framework is constructed, and on this basis, a bidding and bidding model for energy suppliers is constructed. Then, an electricity-gas integrated energy market clearing model is constructed, and each model is jointly solved.

Figure caption

Based on the EMP algorithm package, the CONOPT3 solver is used to solve the above model in the GAMS environment.:



(1) Firstly, input the quotation and quantity of each power generation enterprise and gas supply enterprise, initialize the electricity and natural gas quotation and quantity of integrated energy service providers, and record it as k

(2) Secondly, the CONOPT3 solver is used to optimize the social welfare of the electricity-natural gas market, and the output clearing price and clearing gas price are denoted as l. Then, using the EMP algorithm package, the l output from the lower model is transmitted to the upper model, and the operating income of the integrated energy service provider is optimized based on the l. The k is updated to maximize its operating income and transmitted back to the lower model.

(3) Finally, the electricity and natural gas quotes and volume schemes of various market participants, as well as the clearing price of electricity and natural gas at the time of clearing are output.

Text

$$\max R = \sum_{t=1}^{T} \begin{pmatrix} P_{re,i,t}q_{re,i,t} + P_{rg,i,t}q_{rg,i,t} \\ +P_{rh,i,t}q_{rh,i,t} - (C_{Le,i,t} + C_{Lg,i,t}) \\ -(C_{se,i,t} + C_{sg,i,t}) - C_{DR} \end{pmatrix}$$

$$\max G = \sum_{t=1}^{T} \begin{bmatrix} \sum_i (q_{me,i,t}P_{me,i,t} + q_{mg,i,t}P_{mg,i,t}) \\ -\sum_m q^E_{GENE,m,t}P_{GENE,m,t} \\ q^G_{GENG,n,t}P_{GENG,n,t} \\ -\sum_n -\sum_k (q_{ACE,k,t}P_{ACE,k,t} \\ +q_{ACG,k,t}P_{ACG,k,t}) \end{bmatrix}$$

IEM involves the participation of multiple energy supply entities. Due to the differences in their own capacity and demand, different energy supply entities need to have a more appropriate mechanism to help participate in market transactions. When considering the load side demand response to participate in the bidding, more focus on the electricity market, or consider the user's alternative load or load reduction, less in the medium and long term time scale to consider the user ' s demand response capability.

Summary

In this paper, a day-ahead offer strategy for integrated energy service providers based on multi-energy portfolio pricing in response to the lack of supply-side market power in the single energy market and other problems, combined with the multi-energy synergy and complementarity of the integrated energy market is proposed.