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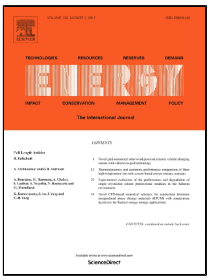

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New Framework for Optimal Scheduling of Combined Heat and Power with Electric and Thermal Storage Systems considering Industrial Customers Inter-Zonal Power Exchanges

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Abstract

Introducing Combined Heat and Power (CHP) units into Active Distribution Network (ADN) can significantly affect the problem of optimal generation scheduling. A new method for solving the problem of Optimal Scheduling of Combined Heat and Power (OSCHP) units of an ADN with Electric Storage Systems (ESSs) and Thermal Storage Systems (TSSs) considering Industrial Customers (ICs) Inter-Zonal Power Exchanges (IZPEs) is presented. The ADN operator may use CHP units to supply its ICs and based on smart grid conceptual model, it can transact electricity with upstream network. However, the electricity transactions between the ADN and its ICs in normal and contingency scenarios may highly complicate this problem. In this paper, linearization techniques are adopted to linearize equations and a two-stage stochastic mixed integer linear programming (SMILP) model is utilized to solve the problem to determine the optimal generation scheduling units. The first stage models the behaviour of operation parameters, minimizes the operation costs, and checks the feasibility of the ICs' requested firm and non-firm IZPEs, while the second stage considers system's stochastic contingency scenarios. The competitiveness of ADN in the deregulated market can be improved by adjusting the proposed decision variables in the two-stage optimization procedure. The proposed method is applied to 18- and 123-bus IEEE test systems to thoroughly demonstrate the benefits of implementing inter-zonal power exchanges.

Keywords: Combined heat and power; electric and thermal storage systems; optimization; security constrained unit commitment; inter-zonal power exchange.

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