

## Aggregation of Distributed Energy Resources Under the Concept of Multienergy Players in Local Energy Systems

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In recent years, in addition to the traditional aspects concerning efficiency and profitability, the energy sector is facing new challenges given by environmental issues, security of supply, and the increasing role of the local demand. Therefore, the researchers have developed new decision-making frameworks enabling higher local integration of distributed energy resources (DER). In this context, new energy players appeared in the retail markets, increasing the level of competition on the demand side. In this paper, a multienergy player (MEP) is defined, which behaves as a DER aggregator between the wholesale energy market and a number of local energy systems (LES). The MEP and the LES have to find a long-term equilibrium in the multienergy retail market, in which they are interrelated through the price signals. To achieve this goal, in this paper the decision-making conflict between the market players is represented through a bilevel model, in which the decision variables of the MEP at the upper level are parameters for the decision-making problem at the lower level (for the individual LES). The problem is transformed into a mathematical program with equilibrium constraints by implementing duality theory, which is solved with the CPLEX 12 solver. The numerical results show the different MEP behavior in various conditions that impact on the total flexibility of the energy system.