# OPTIMAL CONTROL STRATEGY OF POWER GENERATION IN MICROGRIDS

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*Lucrarea prezinta o soluție inovativă de strategie de control optimal pentru un sistem energetic care constă în combinarea energiei termice și electrice (Combining Heat and Power - CHP) cu interconectarea surselor de energie regenerabilă (Renewable Energy Sources - RES), permițând generare hibridă eficientă de energie. Necesarul de energie electrică și termică al consumatorului este controlat prin intermediul unui sistem dedicat de microrețea (microgrid - MG). Strategia de optimizare a fost validata prin controlul sistemului HVAC al unei clădiri și își propune să satisfacă două obiective principale: i) reducerea la minim a energiei absorbite din rețeaua electrică tradițională și ii) garantarea unor condiții acceptabile de confort termic. Programul de răspuns la cerere propus este o strategie de control cu feedback parametrizat în care parametrii depind de starea termică a clădirii, dar și de modelul de ocupare al microrețelei.*

*The paper presents an innovative optimal control strategy solution for an energy system that consists of combining thermal and electrical energy (Combining Heat and Power - CHP) with the interconnection of Renewable Energy Sources - RES, allowing efficient hybrid energy generation. The consumer's electricity and thermal energy needs are controlled by means of a dedicated microgrid system (MG). The optimization strategy was validated by controlling the HVAC system of a building and aims to satisfy two main objectives: i) minimizing the energy absorbed from the traditional electrical network and ii) guaranteeing acceptable thermal comfort conditions. The proposed demand response program is a parameterized feedback control strategy where the parameters depend on the thermal state of the building, but also on the occupancy pattern of the microgrid.*

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**Key words:** Microgrid, Energy efficiency, Optimal control, Renewable Energy Sources, Distributed Generation.

## 1. Introduction.

The innovation consists in combining heat and power (CHP) with the interconnection of renewable energy sources (RES) allowing microgrid to provide an effective hybrid generation. Focusing on the electricity and thermal energy requirement of contemporary buildings, a joint operation of photovoltaic/thermal (PV/T) based prosumers is controlled by means of a dedicated microgrid (MG) system. The bidirectional flow of the electricity and heat model is considered and

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