

# Economic Optimization of Local Energy Markets: Strategies for Prosumers with IoT and Blockchain Integration

## **Abstract:**

This study explores strategies for optimizing local energy markets through analyzing representative prosumers data. Energy communities, which consist of local consumers and generators, offer a unique opportunity to maximize revenues and reduce costs in energy trading. We based the methodological approach on a dataset comprising energy production, consumption, and price data from 20 prosumers with distributed generation and energy storage capabilities. Two key strategies were analyzed: maximizing earnings from the sale of surplus energy by prioritizing transactions during periods of higher prices and minimizing purchasing costs by shifting consumption to periods of lower prices. The results demonstrate an average cost reduction of 18.62% and a considerable increase in revenues for prosumers, substantiating these strategies' beneficial economic impact. The analysis integrates data collected by sensors connected through the Internet of Things, which allows for evaluating prosumers' behavior and simulating scenarios designed to optimize their participation in the energy market. Furthermore, implementing smart contracts is key to facilitating transactions, guaranteeing transparency, and enhancing resource administration. This methodology, which is applicable in regions with considerable renewable potential, establishes the foundation for a transition to decentralized energy systems, thereby promoting economic advancement and environmental sustainability.