

A comparison of individual and global optimization strategies in energy communities

Ivan Mariuzzo

AIT Austrian Institute of Technology GmbH, Vienna, Austria

Extended Abstract

[Download file](#)

Abstract Summary

The optimal operation of energy communities (ECs) depends on how much individual revenues or community revenues are prioritized. Both can be formulated as LP or MILP optimization problems, but the considered interactions between the participants is the determining factor. When individual optimization strategies are used, the best individual financial revenues might be achieved at the cost of worse EC total costs. When central optimization are in place, EC costs are minimized and a higher flexibility provision potential is achieved, but at the cost of potentially worse financial performance for certain individuals. As alternative, hybrid or game-theory based approaches could improve EC total costs by increasing individuals' awareness on the community energy demand and consumption (e.g. in real-time or through forecasts). As result, it is observed how individual implementations could maximize individual revenues from self-consumption and EC sharing. The latter performances can be increased when EC members are fed with real-time or forecasted data on EC consumption and generation. At the same time, the lack of coordination limited the best use of EC flexibility from the global perspective. On the other hand, a fully centralized control of an EC resulted to maximize its flexibility potential as well as ensuring the minimum global system costs and a more grid-friendly behavior. However, certain members resulted to be penalized individually, showing how global optimization might not ensure both individual and global optimums. Hybrid methods can be used to constrain individuals' penalizations and propose a compromise between the best individual operation and the maximization of community-level targets.

Presenting Author Biography

Ivan Mariuzzo is currently a Junior Research Engineer at the Center for Energy of the AIT Austrian Institute of Technology GmbH, in the unit of Integrated Energy Systems. He completed his bachelor and master studies in Energy Engineering at the Polytechnic of Turin (2019) and a PhD in Sustainable Energy Communities (2024) at IUSS Pavia. The current topics of interest are energy communities' optimization and their integration within

the electricity markets, considering their interactions and flexibility provision with grid operators and energy suppliers.