



Contribution ID: 27

Type: **not specified**

On the status of energy communities' integration in existing energy markets

Friday, April 4, 2025 2:30 PM (25 minutes)

Energy communities, following the guidelines defined from the European Commission, gained in the last years an increasing attention in the research. In the European context, a regulatory framework for member States has been provided from the Clean Energy Package for all Europeans in 2019 (European Commission, 2019), where the Renewable Energy Directive REDII (European Commission, 2018) and the Electricity Market Directive (European Commission, 2019) paved guidelines for EU member states to implement renewable energy communities (REC) and citizen energy communities (CEC), respectively. In the Austrian regulatory framework, the RECs definition from REDII Directive has been transposed into the Renewable Energy Expansion Act (Bundesgesetz über den Ausbau von Energie aus erneuerbaren Quellen (Erneuerbaren-Ausbau-Gesetz –EAG)), whereas EMD guidelines are transposed into the Electricity Act (Bundesgesetz, mit dem die Organisation auf dem Gebiet der Elektrizitätswirtschaft neu geregelt wird (Elektrizitätswirtschafts- und –organisationsgesetz 2010 –EIWOG 2010)).

Although attractive for citizens, the prioritization of local benefits for local welfare could represent a challenge while embedding their participation within more active markets. Energy communities are already entitled to provide flexibility services through its members either individually or through aggregation. However, the data exchange between the involved actors result to be poorly regulated, especially between independent aggregators and energy suppliers (Perger, Kalt, Kabinger, Materazzi-Wagner, & Kaiser, 2024). On the technological side, smart energy management and IoT technologies need to achieve a sufficient rollout (Paiho, et al., 2021). Encouraging an active citizens participation to modify consumption/generation patterns plays a crucial role (Hampton, Foley, Del Rio, & Sovacool, 2022), but requires attention in the schedules planning phase. The analysis of such problematics and the proposal of new frameworks are therefore of primary importance to, first, unlock flexibility potential from each individual energy community, and second, foster their cooperation at a higher regional or national level. In this perspective, energy communities could be organized following a cellular structure, where each cell (in the form an energy community) is interconnected physically (grids), and virtually (platforms) (Lehmann, Huber, & Kießling, 2019).

To fill this gap, in this work different options concerning energy communities' integration in electricity markets are proposed, and potential barriers and opportunities discussed. Market opportunities have been identified using as reference the most promising and consolidated energy markets (day-ahead, intraday, balancing) in the current Austrian framework. Although future opportunities could come from the implementation of markets more at the local level, such as local energy markets, peer-to-peer trading, and local flexibility markets, such options are not considered due to their current lack of practical implementation (Capper, et al., 2022). However, lessons learnt could be transferred to any tasks concerning market design frameworks considering current or future trends. Both indirect (customers' reaction to input prices) and direct (central control from an aggregator) schemes concerning energy community's members market participation are investigated. Strategies to gather units' control over limited time slots over continuous control are considered more attractive in practice to gather participants interests, and later involve them within the planning of short-term flexibility provision. The provided analyses are discussed considering interests, opportunities, and barriers of all the stakeholders involved.

As a result, a potential towards market-friendly and grid-friendly behavior could be relatively easily unlocked through participants' indirect reaction to price tariffs. Indirect participation in day-ahead market, through prices sent from suppliers to each customer daily, is found to be relatively easy to implement according to current legislation. Similarly, grid-friendly behavior can be promoted if distribution grid operators are willing to

send daily innovative grid charges to the participants, based on renewable sources forecasts. However, such options do not ensure a proper reaction from the participants, being the schedules not communicated, thus it is still task of suppliers and grid operators to anticipate the participants' behavior. On the other hand, higher potential can be retrieved through aggregation in balancing and intraday markets, where synergies between technical and commercial aggregator could foster flexibility activation driven from prices forecasts. Social preferences are crucial in this perspective, as the availability and flexibility from end-user components need to be properly anticipated before the trading. Bilateral communications in the form of requests and approval are assumed in place, in such a way households can negotiate in advance (e.g. day-ahead, hours ahead, etc.) the hours where a technical aggregator can take the control of components. However, the potential of the provision of flexibility through aggregation is limited from the rollout of smart technologies and IoT development. The potential of forecasts information sharing within the participants is also found to be beneficial. All the stakeholders would benefit from such data, as (i) energy suppliers could use such forecast to negotiate better price tariffs with the customers, (ii) grid operator can anticipate critical situation for the next day, (iii) aggregation operators could consider when to strategically schedule bids to have a lower impact on local energy sharing, and (iv) the energy communities and its participants can behave more community friendly and improve the exploitation of locally produced renewable energy.

Primary author: MARIUZZO, Ivan (AIT Austrian Institute of Technology GmbH)

Presenter: MARIUZZO, Ivan (AIT Austrian Institute of Technology GmbH)

Session Classification: Utilization of flexibility potentials