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Managing energy infrastructures with community involvement: the role of energy communities

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Energy infrastructures and climate issues (1)

- Climate crisis is a major issue for Europe and the world (more recently also the energy crisis..).
- Up to now: insufficient mobilisation of funding, insufficient engagement of citizens and the private sector, and a lack of political leadership.
- According to EU data to meet increasing demand for electricity and achieve climate objectives:
  - investments in the electricity grid shall be doubled (55 billion € per year);
  - investment in clean generation capacity must reach 75 billion € per year.
- Investment in infrastructures are strategic to ensuring security of supply, keeping prices affordable and boosting decarbonisation.

Energy infrastructures and climate issues (2)

- Importance of the active participation of all consumers – households, businesses and communities – in developing smart energy systems and energy infrastructure has been repeatedly stressed.
- Need to create incentives to enable civil society to participate in the energy transition.
- Need to ensure citizens contribute to financing.
- Citizens and community involvement and engagement might help to increase the social acceptance of renewables.
- Energy communities as a possible solution? Maybe, but….

The definition of Energy Communities

- Collective self-consumption and Energy Communities (ECs) are an emerging, decentralized form of energy production by local producers/prosumers for local communities.
- ECs they might take many forms, but the main idea is that energy resources (included infrastructures) are locally managed and controlled by residents and/or local government or businesses.
- Their (stated) primary purpose is to provide environmental, economic or social community benefits rather than financial profits.

Why an Energy Community?

According to recent literature, the main benefits of ECs for local communities concern:

- ❑ the reduction of the reliance on centralised energy sources;
- ❑ the improvement of the local energy security;
- ❑ energy cost savings;
- ❑ economic opportunities for the region;
- ❑ energy justice and demand reduction
- ❑ the improvement of RES acceptance

However, many of these benefits have not been yet empirically proven and remain only speculations or good wishes.

ECs as a standard organizational model

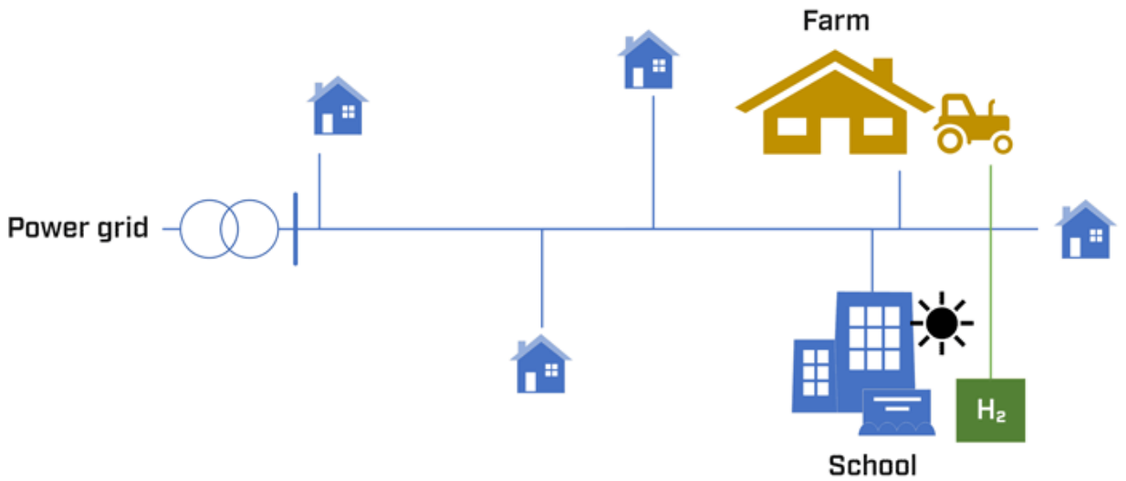
- ECs actual adoption and survival over time, ECs as a standard organizational model is still under question.

- In particular, ECs are:
  - Still at the infant stage;
  - Sometimes with unclear legal frameworks;
  - Highly heterogeneous;
  - Complex;
  - BMs, crucial for their economic sustainability, still require further investigations as well as for acceptance strategies;
  - Benefits for local communities are in part anecdotal (Berka, Creamer, 2018).

→ **Several issues still need to be handled.**

How does an EC work?

- National legislative framework
  - Definition
  - Actors/perimeter
  - Rules of the game
- Trading model
- Business model



National legislative framework

- The implementation of the EC regulations raises fundamental questions about the legal form of ECs, the means of allocating energy to community members and its economic valorisation, the participation of different actors, the different ways of governance.
- Multiplicity of definitions for ECs have emerged in recent years.
- It is important to differentiate between the activity of self-consumption and the notion of EC as an organisational format of this activity.
- Relevant differences at national level still remain.
- Unclear/lack specific legislative framework hind ECs development.

National legislative framework

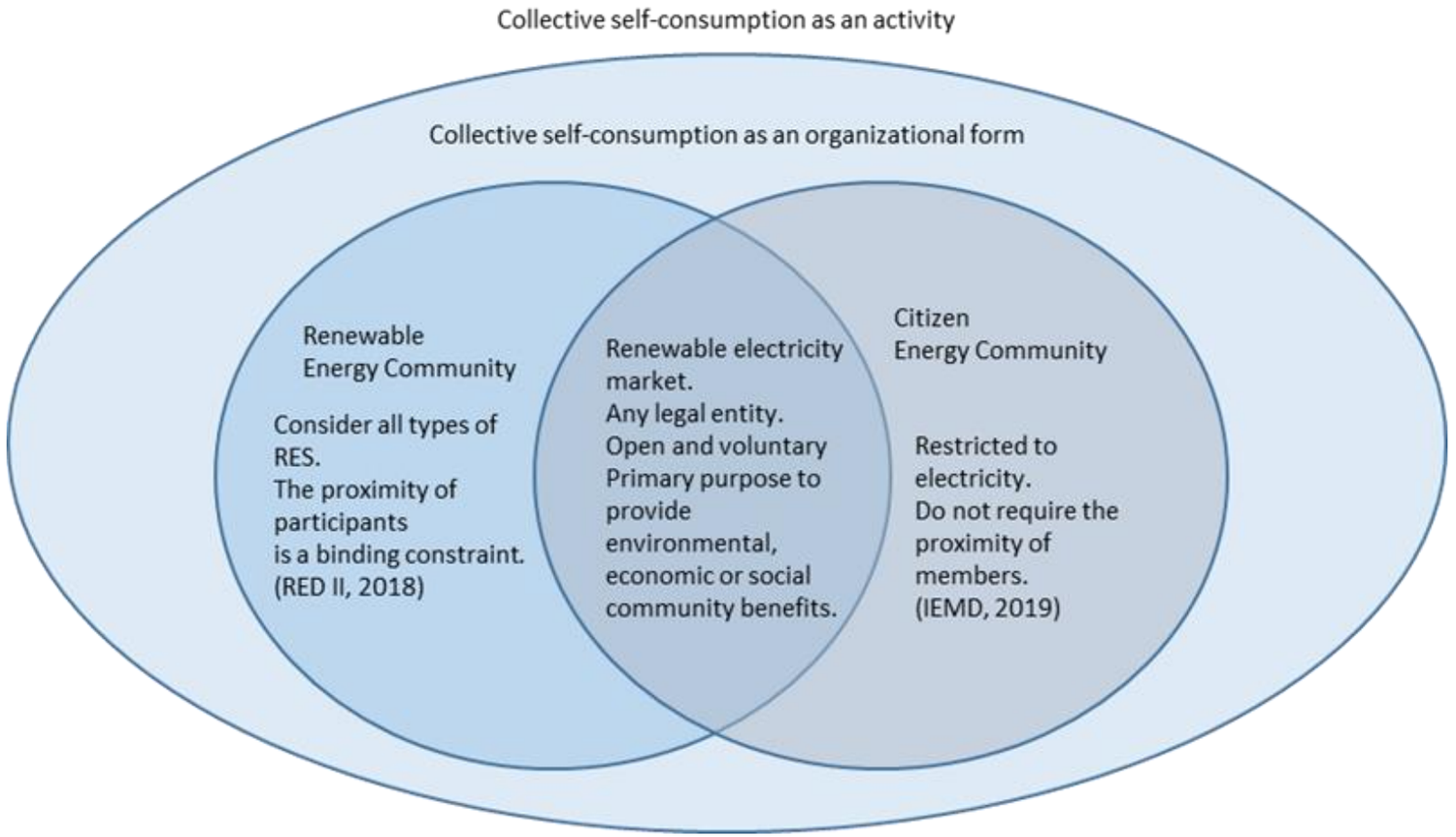


Fig. 1. The concepts of self-consumption and ECs.

Source: Antonioli Mantegazzini B. et al, 2023

Focus: the role of DSOs

- From a legal standpoint, when adopting the status of a DSO, ECs benefit from the same rights and obligations as a DSO, including unbundling rules as well as exemptions applying for DSO operating in smaller networks.
- …at the same time, same duties.
- Who is in charge for public service?
- DSO as a “pure” network or as a service supplier?
- Fair playground/competitiveness.

Trading model (1)

- Key goal: Self consumption/load management→higher stability and reliability of the distributive network.
- ECs might have different roles: suppliers, aggregators, grid operators, with different arrangements.
- Attention to potential problems for consumers' rights (guarantee of security of supply).
- Less exposed, protected position of ECs vs principles of free trade /fair competition.

Trading model (2)

- Need for:
  - Well-designed contract conditions;
  - Transparent data transmission to reduce grid usage/avoid inefficiencies;
  - Appropriate (new?) grid networks:
    - *To avoid an increase in system costs*
    - *To incentive self consumption/storage*
    - *To protect vulnerable consumers*
  - New solutions are developing (eg. P2P energy share).

Business model

- Governance and profit sharing rules are at the basis of the existence of ECs.
- Entry/exit rules.
- Reconciliation of multiple objective functions (sometime in trade-offs).
- Investment costs.
- Prices and optimal revenue distribution?
- (Re)design of network charges to increase self-consumption and valorize transactions (eg: P2P trade) is crucial.
- Role of storage.
- Balance between different consumers (passive consumers, prosumers, utilities, aggregators, ….).
- ECs and external consumers.

Policy implications

- ECs are new actors in the energy market; therefore, their coordination and interaction with “old” existing players are crucial.
- Need for incentives and funding mechanism → There is an urgent need for incentive instruments targeted to ECs to attract public and private funding.
- Role of smart grids/digitalization.
- Awareness and acceptance of EC models needs to be raised by clear and transparent communication.
- Are we sure about (credible) citizens/consumer engagement?

Conclusions and open issues

- ECs, giving a new role to citizens regarding their energy supply, can be a major contribution to a more decentralised energy system.
- Adapted schemes and regulations should help develop ECs in an adopted space, together with suitable models for the corresponding economic and social context within the interest of the consumer's well-being and the well-functioning of the market.
- Fair allocation of costs and benefits represent key elements that contribute to the success of an EC.
- Due to their multi-objective and multidimensional nature, the achievement of their goal requires a real multidisciplinary approach, which considers all possible trade-offs.
- Recent literature would instead appear to favour economic objectives rather than their social or political goals.

Thank you for your attention.

Any question?

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