ORGANISATION OF THE COMMERCIAL AND PUBLIC SERVICES FOR THE INSTALLATION OF LOCAL AND RENEWABLE ENERGY COMMUNITIES (LEC/REC)

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ABSTRACT

The Clean Energy Package refers to Energy Communities (EC) in order to support the energy transition. Collaboration in these communities is key to maximise the local generation of renewable energy, to keep the energy fluxes locally (inside the community) and to control the total energy exchange with the rest of the grid. In the Clean Energy Package, the DSO is seen as a service provider for Local and Renewable Energy Communities (from this point on, no distinction is made anymore, they are all referred to as energy communities). It is currently unclear, however, how private parties and public parties such as a DSO can collaborate on microgrid operation and service provisioning for Energy Communities in order to obtain their goals. In this paper we present a possible solution which is the result from interactive workshops with stakeholders, starting from the clients' needs.

INTRODUCTION

Cities support the climate targets, but face various issues in order to bring their ambitions into reality. District developers are focused on constructing premises that are sold with an optimum profit but have no experience in innovative energy use. Future owners and occupants are in the development phase not yet identified and thus not able to put their commitment forward for installation of local energy services. In addition, legislation and energy markets are not yet supporting these new kinds of energy districts and communities. The Clean Energy Package however states that collaboration on the use and production of energy must be possible in the future energy market. This paper describes how a cooperation between private parties and the public distribution grid operator can realise the EC goals as a win-win situation for the whole society. Based on the clients' needs and basic assumptions for modelling an EC, we held interactive workshops with stakeholders.

ORGANISATION OF THE STUDY AND THE PAPER

At first we described the client's need and made basic assumptions in order to model an EC. Based on the needs interactive workshops with stakeholders were held. They resulted in a profound value proposition that helps EC to organise themselves. That private/public cooperation can be translated into two possible implementation options for the electricity network..

CLIENTS' NEED

In order to design a solution for a particular client, it is necessary to have a good understanding of what the client wants and needs. In Belgium, we already see certain kinds of cooperation [1] and collaboration by people living in the same area. Whereas every individual household would have invested individually, organised in cooperatives they invest together and therefore can make use of economies of scale. In addition, the cooperation organizes services for its shareholders in order to optimize the use of commonly invested goods. I.e. waste collection, rain collection, telecommunications, … As many services as possible are included. But currently the energy networks and energy production are still excluded, due to the regulated market, in which every household is individually treated. However cooperations wish to include energy production units and an optimal use of locally generated (own) energy to extend their offer.

BASIC ASSUMPTIONS

We have modelled the local energy community as is depicted in Figure 1. We distinguish:

Inhabitants in the area of the Energy Community

- in the Clean Energy Package called "Members" or "Shareholders" [2]
- they are free to join the EC

EC-network

- physical electricity network that connects the community-members
- has a connection with the public distribution grid
- in the model we make abstraction of whether the EC-network is privately owned or part of the public distribution grid

Non-Community-Members

- live in the area of the EC
- choose not to join the EC
- are handled individually and have their own electricity meter for billing

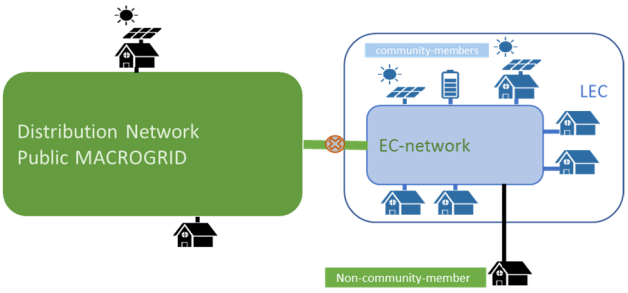

Figure 1Model of an Energy Community

VALUE PROPOSITION OF THE PUBLIC/PRIVATE COOPERATION

With the model and the thorough knowledge of the EC need, a value proposition for Services for Local Energy Communities was derived.
We believe that the EC's need connects with the conditions for future proof energy management:

- It must be able to maximize local renewable production and consumption
- There is an optimized design and dimensioning through bundling of scattered capabilities
- Flexibility is necessary and as such valorized

On top of that EC try to

- Optimize procurement based on their purchasing power in the market
- Create circularity by design

However individual EC encounter:

- Insufficient scale
- High CAPEX
- Complex environment
- Lack of expertise

Therefore, the Microgrid Service Provider (MSP) tries to provide a solution in the form of a one-stop-shop of an all-in managed energy service that includes a total life cycle of the energy product.

The value proposition includes:

- Establish an appropriate legal structure for the energy community to participate in the energy system.
- Design, implementation and exploitation in a balanced collaboration with the best in class suppliers and other stakeholders
- Ownership of the hardware to produce renewable energy
- Financing: a lease formula, with the EC as lessee
- Balancing local production and consumption
- Valorization of flexibility
- Purchase of deficit (consumption>production)
- Providing energy comfort at a price not higher than 'normal', all-in-one
- Keeping the books and taking care of settlement, billing and payments
- Maintenance and service, incl. hotline, in collaboration with parties such as DSO, preferably through a digital channel
- Take-back, reassignment and/or refurbishment of renewable assets (principles of circularity)

The MSP offers this as an OPEX-solution and service model to the community members. As such extra upfront costs (due to investment in production units, energy-flux steering capabilities, smart household assets,…) are omitted. That keeps the selling price of the real estate in EC in line with regular market prices.

In this value proposition the Microgrid Service Provider for Energy Communities does not focus on the design, investment and management of EC-network.
Additionally, the free choice of joining the EC or not, must be guaranteed. Not joining the EC implies making use of the public services of the distribution grid. In the remaining of this paper named as opt-out services.

As such the final public private cooperation on network installation, monitoring of fluxes, management of the network and settlement of the users, turns out to situate itself between

A. the classic, truly publicly serviced network and regulated energy market and
B. the case of a private network that is owned, managed, monitored by the community and in which the settlement is done by the community

Between those, multiple levels of autonomy are possible, they are depicted in Figure 2.

Any of these proposed scenario's conflicts with the currently applicable regulations and legislation in Flanders [3], but makes use of concepts in the proposed Clean Energy Package.

In this table the main tasks to be fulfilled for "grid management of the EC-network" are put in the columns. For each of these tasks, the framework gives the option whether to fulfil it in the known regular way or do it in a EC-decided own way.
For each of the scenario's possible, the last column describes a necessary additional regulated service that links the respective public/private cooperation with the existing regulated market and the public network.

- In Scenario 1 All tasks in grid management for the EC-network are operated by the public network operator, as part of the distribution network. All customers in the community are individually connected to the distribution grid and individually known in the energy market processes. However, they take an extra commitment towards their use of energy and the use of the network through cooperation with other members.
- In Scenario 2: the network and monitoring assets are installed by the public grid operator. The EC-network is managed by the public grid operator.

Therefore the EC-network remains a part of the distribution grid. Privately-owned settlement includes that the community members are no longer individually charged for their network-use and energy but one bill is sent to the community, which autonomously decides how to split it up among its members.

- In scenario 3 and 4 the public network (and monitoring) assets are made available for private use. The management of the grid is done according to special SLA's set by the community.
- Scenario 5 describes the situation of a privately owned network that is connected to the distribution grid but is not a part of it.

Based on the value proposition of the MSP, it turned out that the public distribution grid operator was best in place to provide the network installation and management, including the opt-out services, for the EC-network.

This is fulfilled in scenario 1, 2 and 3, in which the public management is limited to the grid management. The management of the energy fluxes within the EC-network is the responsibility of the MSP.

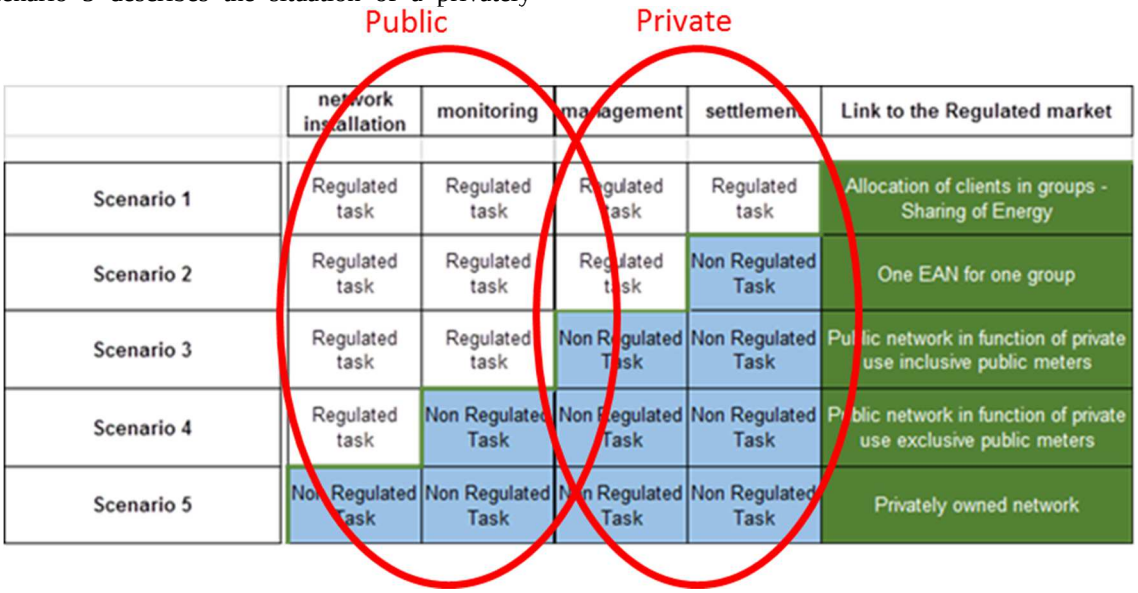

Figure 2 Different scenarios for implementing the public/private cooperation

IMPACT ANALYSIS AND SCALABILITY OF THE CHOSEN PRIVATE/PUBLIC COOPERATION

The proposed private/public cooperation and common value proposition by DSO and MSP has impact on all the stakeholders that want to support (in any kind of way) Energy Communities:

- **Project developer:** cost energy management system is lifted out of the project. Able to present a future proof offer without prohibitive pricing issues.
- **Energy Community:** able to act as a part of the energy system, by bringing scale and expertise in their reach
- **Individual member:** future proof management of patrimony. Able to obtain optimal energy comfort, infrastructure e.g. charging, microgrid ready household appliances
- **Suppliers and other systemic participants** (e.g. DSO): can cope with their core business and are able to collaborate so they achieve the sustainability goals
- **MSP,** as a lessor, uses an anchored financing model. By contracting the best in class parties to build an E2E energy service, performance risk is well controlled. The financing risk is distributed to the lowest and best spread level possible. As an aggregator, the MSP achieves purchase power, with important positive impact on the business case
- **Society:** local production and simultaneous use of energy stimulates the climate transition with support of private capital.
- **Non Members:** Opt-out services and the continued use of the public distribution grid avoid cherry picking of the distribution grid by private companies or installation of parallel networks which would augment the system cost. This creates a sustainable environment, in the mindset that it all should not become "more expensive than usual", for anybody.

EC-NETWORK IMPLEMENTATION POSSIBILITIES

According to our study, in order to fulfil its part in the cooperation, DSO have two options for replicable installation of EC-networks in Flanders. In any way the EC-network that interconnects the community-members

is part of the public grid

1. EC as a new client of the energy supplier and DSO. (implementation according to the model in Figure 1)
   a. The EC-network is a well distinguished part of the distribution grid (has clear boundaries)
   b. Adapted regulated network tariff for the use of the EC-network (management, monitoring and installation)
   c. Connection of the EC-network to the macro distribution grid
   d. One invoice for EC on energy exchange with the macrogrid, use of the macrogrid
   e. EC-service for management of the energy fluxes: steering of local demand in function of local (own) production.
   f. EC-service for settlement (and split-up of the network and energy costs) to its individual members
   g. Opt-out services from DSO to EC for non-members (i.e. individual connection and monitoring, invoicing of individual energy and network-use)
2. Individual members remain autonomously connected to the distribution grid, but cooperate on the use of local energy. They might take an engagement to their network use.
   a. No clear (boundaries for the) EC-network.
   b. Members might live distributed in the area of the DSO
   c. Total consumption of every client combines the global consumption with his participation in shared local energy generation
   d. Settlement rules based on agreements made in the cooperation for augmented use of self-invested energy
   e. Individual clients get an adapted individual network tariff that reflects the cooperation and augmented use of the local network (if applicable)

Figure 3 Implementation solution 2 for EC-network

FUTURE WORK

The result of this work will continue with real life demonstration and hands-on implementation.
Since the concept is in conflict with today's regulation, the implementation plan is to (in parallel)

1. Implement the steering and optimisation of the local use of energy on a private site with multiple buildings
2. In depth risk assessment for the MSP and its services detailed product development
3. Organise additional user-workshops with project developers, cities and other interesting stake holders through community-based engagement strategies [4]
4. Present the concept of EC-network to the regulator in order to discuss potential impact on legislation required [5] to implement the concept in real life, with a real EC and real members

CONCLUSION

The hands-on workshops with stakeholders were key in the study and have led to a fast and good understanding of the clients' needs for local use of the locally produced energy. A mapping of this wish with the current regulation, way of working in cooperatives and the definition of sustainability set by the consortium: the new model should not become "more expensive than usual", for anybody, has led to a value proposition and cooperative business model enforced by the strengths of both public and private parties. Which has on its turn led to two implementation strategies for the EC-networks by the public DSO. These strategies will be examined in further study and demonstration.

ACKNOWLEDGEMENT

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REFERENCES

[1.] T. Bauwens, B. Gotchev, L. Holstenkamp, 2016," What drives the development of community energy in Europe? The case of wind power cooperatives", *Energy Research & Social Science* vol.13, 136–147.
[2.] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition
[3.] http://www.vreg.be/nl/energiedecreet
[4.] Project Partners, S3C, Report on case analyses, success factors and best practices. S3C Deliverable 3.4. http://www.s3c-project.eu/
[5.] I. Lammers and L. Diestelmeier, 2017, "Experimenting with Law and Governance for Decentralized Electricity Systems: Adjusting Regulation to Reality", Sustainability, vol 8, 212 http://www.mdpi.com/2071-1050/9/2/212
[6.] https://flux50.com/