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D1.2.2 Most Prominent barriers and best practices

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Contents

Introduction

This LECsea deliverables provides an overview of barriers and challenges faced by energy communities, as well as some best practices on European energy communities. The reports starts with the barriers and challenges, linking to literature and existing cases. 3 types of barriers are discussed:

- Socio-economic barriers
- Technical barriers
- Institutional and regulatory barriers

The text provides a further analysis on whether listed or claimed barriers are effective barriers for energy community, or whether they link to legitimate requests or to apply to diverse initiatives and not only energy communities.

The Best Practices provide a selection of 4 cases, Samsø in Denmark, Ecopower in Belgium, ElektrizitätsWerke Schönau in Germany, and Ameland Energiecoöperatie in the Netherlands. The different cases are described and the barriers they face are discussed.

Barriers

Many barriers exist in relation to Local Energy Communities (LECs). These can be barriers towards promoting, organizing, or maintaining a LEC, as well as barriers related to the motivation and means to join an existing LEC. The different barriers have been reviewed in literature for Renewable Energy Communities (RECs), renewable energy projects, smart energy projects, collective energy actions, collective prosumption, or in general for (local) energy communities. In the following, the different types of barriers are presented, following three broad categories: Socio-Economic, Technical, and Institutional and regulatory.

Socio-economic barriers

Socio-economic barriers are related to social, cultural and economic aspects that prevent individuals from starting or joining a LEC. The views, behaviours and abilities of individuals, as well as cohesion within the local community, shape the way LEC can be set up and organised and determine its success and longevity, but also its contribution to societal goals.

Community Engagement

Heaslip et al. have studied the motivations and reasons for individuals to support and participate in a sustainable energy community (Heaslip et al., 2016). In general, they found people were more motivated by immediate benefits for their own community, such as energy autonomy and reduced energy prices than for global benefits, such as reduction of GHG emissions. Furthermore, their attitude towards such projects depends on whether they have previously experienced similar projects in their area, as has been found for the example of wind farms, for which support increased after the project was commenced.

While gaining the support of the local community might sometimes be an issue, even when there is support, that is no guarantee that the project will attract enough members. There is a general gap observed between the support of people for community energy projects and the willingness to take action and participate, due to barriers including practical issues, individuality, reluctance to take responsibility and lack of expert involvement in the projects (Heaslip et al., 2016). While supportive, people might not be personally motivated to participate because they are not interested in the topic, or they don't perceive an immediate benefit for themselves, for example, because they consider their current energy costs as low (Biresselioglu et al., 2018). Lack of interest may be due to ignorance, resistance to change, scepticism about the technologies, opposition due to nature conservation reasons, distrust in the LEC's governance or different cultural values and social norms (Biresselioglu et al., 2018; Brummer, 2018). Often participation is based primarily upon financial benefits for the participant (Conradie et al., 2021; Dóci, 2017; Heaslip et al., 2016). Furthermore, individuals may choose not to participate because of cultural issues, for example, negative attitudes towards collective ownership (Kacperski et al., 2020), or simply because of insufficient time or financial means.

Other reasons prohibiting the emergence of a LEC may be linked to poor communication between stakeholders, and the lack of a "key influencer" that has the respect and attention of the community and can act as an ambassador for the project (Heaslip et al., 2016).

Alleviation of Energy Poverty

According to the European Commission's Renewable Energy Directive (RED II), RECs should not limit their contribution to the decarbonisation of the energy system, but also fight energy poverty (Directive (EU) 2018/2001).To address energy poverty, LECs should be inclusive of vulnerable groups, allowing them to benefit from lower energy prices, increased energy efficiency and comfort (Hanke et al., 2021). While the emergence of LECs may very well progress without regard for vulnerable groups, achieving the goals of the European Union for a just energy transition would require several obstacles to be overcome. Currently, participation in and benefiting from LECs is still a privilege of certain social groups, for instance in Germany middle-aged high-income men with technical higher education (Hanke et al., 2021). Barriers for vulnerable households to participate in LECs may be related to lack, or perceived lack, of social and economic capital. This does not only concern financial resources, but also awareness and knowledge about energy communities, and generally limited access to information and contacts with founders of LECs (Hanke et al., 2021). Furthermore, vulnerable households may have other issues to deal with than energy, making participation in a LEC a low-priority concern, for which they may not have time. Besides, financial difficulties tend to render these households reluctant to take the financial risks related to the investment in an energy community (Hanke et al., 2021).

Aside from obstacles that exist on the side of vulnerable groups, important barriers are also related to the initiators, other members and structure of existing LECs. Some solutions from the LECs side that try to overcome the barriers for participation include reduced membership fees or lower share prices for specific groups, as well as targeted information and engagement campaigns. Hanke et al. studied European RECs in terms of their attitude and actions towards vulnerable groups, An important issue seems to be the lack of understanding of what energy poverty is, who is affected and how to approach these groups, as well as assumptions about their situation and intentions (Hanke et al., 2021). The biases and values of LEC founders often also determine the members that join the community. Nevertheless, even when the intention to embrace vulnerable groups in the LEC is there, communication issues, as well as lack of dedicated human and financial resources could pose barriers to the engagement and inclusion of these groups.

Getting Professionals on Board

The systems for these LECs have a high degree of complexity, this can scare off individuals not familiar with these systems. Also, many systems are still very new, which decreases the knowledge available amongst professionals (Lazdins et al., 2021). This is a barrier that is not specific to LECs but to all new technologies in general. As Heaslip et al. point out, people often expect the involvement of experts in a LEC project in order to be motivated to participate as well, which further hinders the emergence of LECs (Heaslip et al., 2016).

Furthermore, the concept of LECs was widely promoted as cost saving, before the assessments on cost savings for grid operation were made. These high expectations on return of investment and reduction in energy bill were included in many LEC business models. Most members states have no to a very limited reduction on the energy bill (Frieden et al., 2019), and very low remunerations are expected for services such as congestion management (Felice et al., 2021). This full understanding is not yet widely spread and hence a lot of so-called professionals have difficulties making their promises reality. This is substantially linked to energy communities, but refers at least partially also to e.g. developers of services for aggregation of low capacity flexibility.

This lack of true expertise is also linked to a lack of adequate skills, in these case interdisciplinary skills. This is also elaborately described in the Erasmus project EDDIE[1], D2.2. Current and future skill needs in the energy sector. Again, this is linked to the further digitalisation of the energy sector and a more flexible muli-energy system

Legitimacy Issues

Collaborative structures such as LECs are not always well perceived by other stakeholders, sometimes limiting the possibilities for financing sources and participation. According to Huybrechts and Mertens, there are three types of legitimacy: pragmatic, normative and cognitive, out of which the last is currently more problematic for cooperatives (Huybrechts & Mertens, 2014).

The former is a result of the benefits the different stakeholders perceive. For LEC members, as well as technology manufacturers and installers or workers, depending on the type of LEC, the interests and benefits are generally clear to identify. However, other stakeholders, such as banks, investors or competitors on the market may not benefit directly from a LEC or may be even disadvantaged by it, with as a result not being supportive.

Normative legitimacy stems from the perception of the LEC based on the moral values and views of the stakeholders. In most of Europe, the attitude towards joint investments and initiatives is generally positive, even though some stereotypes may exist in Eastern European countries against collective ownership for historical reasons (Huybrechts & Mertens, 2014; Kacperski et al., 2020).

Finally, cognitive legitimacy may be the most difficult to establish for LECs (Huybrechts & Mertens, 2014). This sort of legitimacy is acquired for a type of organisation when it is recognised and considered as a well-established form of organisation. Given that LECs are not yet "the norm", in many countries cognitive legitimacy has not yet been achieved. This is mostly owed to a lack of information about LECs, and because cooperative decision making models are on the edge between the well-established for-profit organisations and purely social organisations, and thus don't fit any of the "standard" categories that people are familiar with (Huybrechts & Mertens, 2014). As a result of this lack of cognitive legitimacy, LECs may find less easily support from various stakeholders.

Access to Financing

The lack of access to finance is often mentioned as one of the main barriers to the development of LECs. Without initial capital, it is difficult for a LEC to join the market and compete with well-established competitors or oligopolies in the energy sector that can make use of the economies of scale (Huybrechts & Mertens, 2014). However, due to the lack of legitimacy, inflexible market structures, uncertainties around feed-in-tariff levels and the risk aversion of financial institutions and investors for innovative projects, this initial capital can be difficult to secure (Huybrechts & Mertens, 2014; Reis et al., 2021). This is particularly the case for vulnerable households, whom both don't have access to capital and prefer not to take financial risks (Hanke et al., 2021). The role of market incentives and support mechanisms for LECs is therefore considered important by local communities (Dóci, 2017; Koirala et al., 2016). Furthermore, access to credit sources can be improved by demonstrating the viability and strong business case of the project (Reis et al., 2021). Though, the lack of an effective business case is linked to the before mentioned lack of effective added value from a system perspective (Vandevyvere et al., 2021). This reality negatively impacts the risk assessment of the investment and hence the decision by the

[1] https://www.eddie-erasmus.eu/about-eddie/

financing body. It is to be discussed whether an undertaking (i.e. the establishment and operation of an energy community) that has no convincing business model, is to be financed by a financing body.

Business Cases

In order to start a LEC, secure the necessary funds, and attract more members, a viable business case is important. However, not all LEC pilot projects are easily replicable, as they mostly depend on subsidies to make the project viable and lack a clear business case to encourage others to replicate the project (Kacperski et al., 2020). Developing an innovative business model that is based on the current European regulatory framework for Renewable Energy Communities (RECs) and Citizens Energy Communities (CECs) is necessary. Reis et al. have reviewed business models for energy communities in the EU and presented eight archetypes, including among others energy cooperatives, community prosumerism, community collective generation, community flexibility aggregation.

Though, independent on the organisational form, the lack of effective cost saving services that can be participated in through an energy community, is affecting the business case. Several of the energy regulators interviewed by the Bridge taskforce LEC indicated the lack of effective added value to be the main reason to not be able to justify reduction on tariffs for energy communities (Peeters et al., 2021). Energy communities, as well as aggregators of small-scale flexibility and even individual consumers could all deliver services for grid management at distribution level, or team up for services to the transmission level. There are 2 important remarks on the potential remuneration for such services. The first is the lack of distribution-level markets in most member states, the second is the often-substantial overestimation of the value of services at a distribution grid. In most EU member states, the current congestion challenges at DSO level could still be resolved with a cable with higher capacity. The cost of such cable replacement is to be distributed over the typical depreciation time of 50 years and over all connections on the cable. A typical annual "saving" could than be imagined to value around 10 to 20 € per connection, in the assumption that the provided services would be overcoming all congestion issues. It is not impossible, just challenging, to provide measurement and automation as well as a line-level control for the stated value per connection per year.

Organisational problems

Organisational barriers within the LEC are related to lack of resources, namely staff shortage and limited available time, given that members are usually volunteers. Apart from human resources, also limited financial means prevent LECs from expanding by means of more communication campaigns and engagement activities. This is for instance a reason often cited by RECs that fail to address underrepresented groups (Hanke et al., 2021).

Other organisational problems may arise when searching for appropriate space to installing communal assets (Peeters, 2020). Especially in cities where space comes at a premium, this might make installing communal assets a lot more difficult, both because of the costs, and the permitting.

The type of legal entity that is allowed by Member States for an energy community could impact the business case. Pre-defining the organisational form is sometimes discussed among policymakers to facilitate implementation as it avoids dealing with the complexity of the choice. Also, governance aspects are not only determined by the national energy community regulations as such but strongly by the rules embedded in the specific corporate laws. Some MS such as Slovenia or Greece, mandate energy cooperatives as sole legal form.

In general, LECs may underperform because of the limited experience of the founders, combined with the lack of dedicated and remunerated experts (Lazdins et al., 2021), and mainly the lack of remunerable value. Other problems could arise from communication problems in case of many members, a slow decision process, the presence of so called "free-riders" in the community, lack of trust to the leadership or goals of the LEC, and potential conflicts between members or the LEC and other stakeholders (Huybrechts & Mertens, 2014; Koirala et al., 2016; Lazdins et al., 2021). Also, the decision-making process and the changes therein impact the success to growth.

Technical barriers

Technical or technological barriers contain barriers that are limiting the roll-out of LECs through technologies that aren't mature enough yet or aren't cost-effective enough. In general, these are barriers that are removable by investing in future research to further mature these technologies or to decrease their price. Cost-effectiveness can also be increased by economies of scale. These might just need a kick start to get to a price point where they become commercially interesting.

Lab versus Real Life

Several of the promoted LEC pilots have been developed with substantial financial support. While they all bring interesting learnings, the circumstances under which they were developed and tested are not representative. Exceptional funding such as the conditions reported by Sperling (Sperling, 2017), or the specific case of a regulatory sandbox as De Ceuvel in Amsterdam,[2] the pilot case of EDF in London,[3] provide interesting learnings but should be well-explained with regards to the limitations for replication and the effective business case as well as its dependency on funding. Today, over 200 million euro of EU funding and an unknow amount of national, regional, and municipal support is given to projects on energy communities and there are further open calls. Several of these pilots test new control systems, or new technologies, though more than ones in unrealistic cases, or cases in which it is known upfront that they will never materialize.

As such, it is not the state of technology but again the lack of an effective business case in the absence of funding or non-replicable test conditions that hinders further uptake.

Intermittency of Local Production

Local production of renewable energy does mean that the renewables involved in the LEC are subject to the same weather and environmental conditions at the same time. Therefore, LECs do remain dependent on the grid to provide electricity during limited production and absorb electricity when generation exceeds demand (Koirala et al., 2016). While reported in literature, this is not a barrier linked specifically to energy communities. Any individual with a self-consumption model, any company with solar panels and even producers with large solar and wind energy parks suffer from the intermittency, which is inherently linked to the type of renewable energy production.

[2] https://spectral.energy/news-3/jouliette-at-deceuvel/
[3] https://www.edfenergy.com/media-centre/news-releases/edf-empowers-social-housing-residents-trade-solar-energy

From an environmental perspective, off-grid communities would not be the way forward in most European member states. Remote communities and islands could be exceptions. To be fully off-grid, the community would require substantial oversizing of assets, addition of electrical storage, and inclusion of weather independent back-up such as from biogas, wood or bio-waste. A grid connection would avoid the need for increased materials or emission intensive back-ups.

Local grid balancing

The flexibility in demand within a LECs could (in some cases) also be used to help balance the local grid. While at the level of a single connection, hence behind the meter, matching production and consumption is economically interesting, in many member states this isn't financially viable between different members of the LEC. There are two elements in this. The first is the price consumers are paid for injection which currently is only a fraction of the price they pay for consumption (Koirala et al., 2016). The second one is the cost related to the necessary communication between devices by different owners or users (Reis et al., 2021). Again, this barrier related to local grid balancing cannot be solely linked to the case energy communities. Aggregators of small-scale flexibility or simply owners of assets at two different metering point, suffer the same challenge.

Slow uptake of digital meters

To date, many activities are not yet possible in many Member States due due to technical constraints such as the roll-out of smart meters and the availability of real time data. Digital meters enable participation in flexibility services (when available), access to dynamic energy prices, and participation in energy sharing. Aside from the latter, the slow roll out of digital meters impacts many potential providers of flexibility services.

Institutional and Regulatory barriers

Institutional barriers are related to the established framework conditions that prohibit the emergence of LECs, for instance policies and infrastructure adapted to existing oligopolies on the energy market, lack of authority support, or administrative barriers (Lazdins et al., 2021). Regulations, and particularly, constantly changing regulations can also be an obstacle to the formation of LECs. With the European Clean Energy Package, the recast of the Renewable Energy Directive (RED II) and the Internal Electricity Market Directive (EMD II) entered into force in 2018 and 2019 respectively. These directives introduced definitions for Renewable Energy Communities (RECs) and Citizens Energy Communities (CECs) and provide relevant legislative support. Member States had to transpose these directives into national laws by June 2021.

Network Tariffs

General electricity consumption

Network tariffs that are a flat rate do not encourage users to optimize their electricity usage to help reduce the load on the grid (Van Summeren et al., 2021). Most member states additionally offer a peak/off-peak electricity tariff with the off-peak period being linked to night and weekends. This was introduced to flatten the demand and have household energy consumption moved to periods when industry consumption was lower. The flattened demand matched the older generation of electricity production systems. This disconnection from local production in a LEC does not favour local matching of demand and supply.

The new EMD has introduced dynamic tariffs and this is slowly being offered to end-consumers in the different member states, though require access to a digital meter. These tariffs follow more closely the price evolutions on the wholesale electricity market and are hence linked to the dynamics in the production system. As an individual or as an energy community, these dynamic electricity tariffs could be opted for. Especially in case the energy community includes car charging or a heat-pump driven district heating system, dynamic tariffs could bring added value.

Storage

Collective storage within a neighbourhood can be a more efficient solution compared to individual storage. Additionally, the provision of service to the grid operator could be simplified and/or participation in specific flexibility services to the transmission level could become possible due to capacity of the collective device being higher than the minimum required for such services. Hence, when a battery is charged taxes and distribution costs are added to the price of electricity and when the battery is discharged only the price of electricity is paid back. Therefor the battery loses money when it is operational and possibly helping balance the grid. This approach is in line with European regulation: an amount of energy can only be taxed ones, according to the adopted revision of the Internal Electricity Market Directive, which is the case here. The lack of an effective pay-back (net-metering) is the reason for the absence of a business case, linked to the fact that such storage solutions are generally not needed from a local grid perspective. If the service is not needed, one cannot request society to pay for it (which is what would happen if the DSO would pay a fee that would make it a viable business case).

Different connection types

Grid access for private and closed distribution grids is exceptional. There are several reasons for this. A first important reason is the current model for the division of the cost of the operation of the distribution and transmission system, as well as for a number of other costs[4], being a division based on energy (and soon in many member states based on capacity). If a select group of end-consumers decides to develop a separate system, this increased the price for all others including those at risk for energy poverty. Additionally, such a specific grid is linked to a location and generally to new developments. While the cost per end-consumer could be claimed to be lower, the investments have to be paid. Even if it would be possible to offer lower tariffs, the question is what will be done with consumers that cannot pay their energy bill, those that are in need for social tariffs, or those on a budget meter. Private grids, even in the form of privatized local lines, include a risk for segregation focussing the development mainly in areas with less (risk for) poverty. Next, there is another adverse effect of privatizing specific parts of grids. Take the specific case of Finland. With very remote areas as e.g. Lapland in the north of Finland. In case grids become privatized, it will be the ones with a high density of end-consumers. Hence, in Finland, the very scarcely populated northern part would have very high electricity tariffs. It would impact who lives there, and might lead to certain areas being completely desolate for several months a year. The risk for land occupation by non-European neighbouring countries then becomes an effective reality, hence Russia in the case of Finland.

Privatizing grids does not always impose a risk, especially when the LEC is large enough and bares no risk for the above mentioned aspects of poverty, segregation and potential consequent adverse effects.

[4] https://ec.europa.eu/energy/sites/default/files/documents/bridge_tf_energy_communities_report_2020-2021.pdf

The large size is additionally needed to be able to have sufficient contributors to pay for the grid overtaking, operation, maintenance and continuous stand-by and interventions in case of technical problems or calamities.

Tendering Process

In some reports, it is noted that a rigid and time-consuming tendering process for the expenditure of government money is a barrier to the implementation of LECs by local governments. However, this is not a specific barrier to LECs, and is a procedure that has been established to ensure a fair market and a best value for use of public money.

Administration Issues

The integration of those assets that could be supporting a viable business case for LECs, or that could be part of a LEC, such as shared electric vehicles and their charging infrastructure on public land, cooperation of the local government is needed. Since LECs are new to most local governments many don't know how to deal with these issues or which processes to followed or apply.

An example of this is the Schoonship Energie Coöperatie (Hannoset et al., 2019). This group of 46 floating households also wanted to include shared electric vehicles in their cooperative but struggled with getting parking spaces allocated to their vehicles by the city administration. A public administration cannot simply allocate part of the public space to a single group of users, and hence this barrier is justified from the point of view of fairness and equal treatment towards all citizen. One way of overcoming this is to develop a set of rules to acquire a x-year long access to dedicated parking spaces in the public domain, which would then be valid for anyone who complies.

Also other factors could be burdensome, such as market barriers with respect to trade flexibility or the difficulty of obtaining access to green energy certificate, as well as billing and metering arrangements required for heat or electricity trading (Kacperski et al., 2020). Again, it has to be analysed on a case-by-case basis whether these apply to a LEC specifically and uniquely, or whether e.g. all shared mobility services, or all small scale flexibility aggregators, encounter these challenges.

Permits

Since several LECs projects are pilots as part of research and innovation actions, they might use innovative technologies (or state-of-the-art technologies that are for the first time implemented in a specific region) to accomplish their goals, there are often no clear procedures to follow. Governments often do not know which of their own procedures applies when it comes to first of a kind implementations, or which level is authorized to permit a certain installation. This can lead to long administrative procedures where multiple governments and regulators need to be involved to reach a final decision.

An example is the Neighbourhood battery placed in Oud-Heverlee under the H2020 STORY project (Peeters et al., 2020). This battery would help with peak shaving and congestion management: it could provide energy at moments of high demand when the old distribution line in de street could not handle the simultaneous consumption of the street, and it could store electricity when a lot was being produced in the street as a high percentage of the houses is equipped with solar panels. By storing the energy at these moments with high local production, and hence high voltage on the local line, it contributed to preventing curtailment. Though, to install such a battery designed to generate a benefit to not only the neighbours but also the grid, no clear permitting procedure was available. Workshops with the local, regional and Flemish governmental services needed to be organized to reach a verdict. Although a lack of technical skills among the civil servants who normally work on building permits, and no understanding of the electricity grid and market, one if their conclusions was the lack of societal benefit of such a device. This links to their fear of permitting something that would benefit a part of their citizen only and the potential of being held accountable for that.

Again, this barrier cannot be linked to energy communities as such. It relates to any actor aiming to install a less-known technology connected to public infrastructure or located on public infrastructure.

Best Practices

In this section, some examples of local energy communities are presented from different countries in Europe. With a more detailed analysis, the different approaches that have been taken are demonstrated, as well as the wide range of activities performed by energy communities, and the barriers and enablers identified for the different cases. The following cases are analysed:

Name	*Country*	*Organisation type*	*Link*
Samsø island	Denmark	Island community	https://energiakademiet.dk
Ecopower cv	Belgium	Cooperative	https://www.ecopower.be
ElektrizitätsWerke Schönau eG	Germany	Cooperative	https://www.ews-schoenau.de
Amelander Energie Coöperatie U.A.	The Netherlands	Cooperative	http://www.amelandenergie.nl

Samsø island, Denmark

Samsø is often used as an example of an island-pioneer of the energy transition, with community energy projects being in the heart of its success. It is named Denmark's renewable energy island, covering its annual electricity needs through locally produced renewable energy, and aiming to become entirely fossil-free by 2030.

Background

Samsø is a Danish island located in the Kattegat Sea. In 1998, the island won a competition, sponsored by the Danish Ministry of Environment and Energy, to become a model renewable energy community and shorten its transition to 10 years. This event started the energy transition of the island, paying the salary of one person, appointed to plan and manage the transition.[5] Samsø realized its ambitions for the largest part, and used the momentum and achievement to make energy training and energy tourism additional sources of income on the island.

FIGURE 1: SAMSO COMMUNITY[6].

Before the start of the project, Samsø's energy mix was equal to that of Denmark as a whole, since the island is interconnected to the main Danish grid. This also means that the cost for electricity on the island is the same as in the Danish mainland, which is one of the highest tariffs in Europe. The high cost of electricity is mainly related to non-production related costs (VAT, electricity tax, Public Service Obligation, TSO tariff, DSO tariff). The energy mix at the start of the transition consisted mainly of non-renewable sources with oil, diesel and petrol making up the bulk of it (Sperling, 2017).

During the 10-year transition, 21 wind turbines where installed, of which 11 onshore and 10 offshore, counting a total of 34 MW[7]. While the island has become a net exporter of electricity because of these installations, it is still connected to the Danish grid: due do the variability of wind energy, Samsø still depends on the grid to balance supply and demand[8].

The heating on the island has transitioned as well. Four district heating systems were installed, fuelled by solar heat or biomass and connecting 759 homes, businesses and institutions.

Support from the local population was important for these projects, and their inclusion in the projects was a key factor to gain their support. Ownership of the installed wind turbines is organized in several different ways: some wind turbines are owned by the island's municipal government, with the proceeds being reinvested in future energy projects, other wind turbines are privately owned by local farmers who pooled resources, and some wind turbines owned by cooperative organisations with many small shareholders.

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[5] Energy positive: how Denmark's Samsø island switched to zero carbon | The Guardian

[6] https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_responsible-island-samso.pdf

[7] Energy positive: how Denmark's Samsø island switched to zero carbon | The Guardian

[8] http://euanmearns.com/wind-power-denmark-and-the-island-of-denmark/

Also for buildings, multiple incentives were offered to convince home-owners to reduce their energy consumption or opt for green energy alternatives. These incentives were a 30% investment subsidy when converting to solar thermal, biomass or a heat pump, with additional incentives to switch from electric heating to a central heating system based on water. There were also subsidies available up to €3,247 or 50% of the total cost, whichever is lower, for energy efficiency refurbishments. The cost for a connection to the district heating was lowered from €6,000 to €10 if the connection was requested upfront. This incentive was brought in to ensure enough houses were connected to the new district heating systems.

Samsø has gained the image of a frontrunner renewable energy island. In 2007, the Samsø Energy Academy (Samsø Energiakademi) was founded as the knowledge centre of Samsø, in order to share the knowledge gained through the island's energy transition. The Academy promotes the island by showcasing the community-driven process and the renewable energy projects to visiting energy tourists from around the world, and by hosting meetings on education and research, and organising seminars and exhibitions about energy-related topics.

Enablers

- Acceptance and participation were motivated by the job opportunities linked to the transition. Jobs were created in the energy sector in constructing, inspecting and maintaining the installations, such as the wind turbines and district heating systems. These jobs could be performed by local residents after additional training. Next to the new jobs that were directly created by the installations, there were also new jobs in tourism as the island promotes itself as an example for the energy transition. The fact that these jobs are performed by local residents improves their connection with the installations (International Institute for Industrial Environmental Economics (IIIEE), 2009).
- The island worked with a bottom up concept, where the residents were involved in the decision making processes. This helped in reducing the resistance for certain technologies such as wind turbines (International Institute for Industrial Environmental Economics (IIIEE), 2009).
- Citizens on the island also got the option to get financially involved in the transition by the different ownership structures for the wind turbines. These allowed residents to buy into a small portion of the turbine with good warranties from the government on the profitability of the turbines.
- Citizens that could not participate in any investment, due to a lack of financial means, felt left behind.

Barriers for replication

- The creation of local jobs as part of the success of Samsø isn't always easy to replicate. The island started from a situation where there were already local tradesmen with experience in smaller wind turbines. This meant the additional training necessary for them to work on the wind turbines was more limited (Sperling, 2017).
- The bottom-up approach for decision making and involvement does rely on the residents abilities and willingness to engage in the necessary discussions. On Samsø, this culture was already present, as locals would regularly participate in discussion with each other at meetings in the various local associations (Sperling, 2017). However, this is not necessarily the case in other communities.
- Another success factor for the Samsø case was the population's familiarity with cooperatives, as they were already present in agriculture on the island (Sperling, 2017). Communities without

contact with such organisational structures would have more obstacles to face trying to replicate the success of Samsø.

- Limited attention to effective inclusion is not necessarily a barrier, though its overcoming would be exemplary.
- A main barrier is the excessive funding and unique guarantees that were made available to enable this first-of-a-kind transition. As an example for the electricity production by wind turbines, the following applied: During the operational phase, 3 different subsidies are of relevance:
    - Decommissioning certificates valuing 0.023 €/kWh and applicable the first 5 years of operation,
    - Fixed price addition of 0.0134€/kWh for the first 22 000 peak load hours,
    - A compensation for a too low spot market price with a compensation to reach at least 0.044 €/kWh. The below graph shows that the values above 0.044 €/kWh where common until 2011, but there has been a decline in the sport market prices since then. This decline is expected to continue.

Ecopower cv, Belgium

From a small group of activists in the 1980s, Ecopower grew to become a cooperative with more than 60,000 members, and the founder of REScoop.eu, the European federation for energy cooperatives.

History

In the 1980s, activist Dirk Vansintjan and fellow members of his community founded Ecopower in a small village in Flanders, Belgium. Renewable electricity production started with the conversion of an old watermill, which is still used as a home for the founder, his family and friends (Friends of the Earth Europe, 2020). The project attracted interest from the community, with new members joining and supporting the development of new wind turbines and solar panels. In 1992, Ecopower cv was founded as a cooperative under Belgian law, with the purpose to invest in renewable energy, to supply 100% green energy to its members, and to promote a rational use of energy, renewable energy and a cooperative economy in general.[9] Ecopower also founded REScoop.eu in 2013, a growing network of renewable energy cooperatives in Europe (Friends of the Earth Europe, 2020).

Ecopower today

Ecopower is a Belgian cooperative (cv: coöperatieve vennootschap), with more than 60,000 members. With the contribution of its members, the cooperative invests in renewable energy projects, either developed on its own or in collaboration with other cooperatives. Ecopower produces 100% renewable energy, mostly wind and solar, and supplies it to its members in the Flemish region in Belgium. In 2020, Ecopower operated 23 wind turbines, 3 small hydro power installations, 1 co-generation installation and 322 decentralised solar PV installations on the roofs of schools and houses, supplying approximately 1.64% of household electricity in Flanders (Friends of the Earth Europe, 2020). Ecopower is

[9] https://www.rescoop-mecise.eu/aboutmecise/ecopower

recommended as a green supplier with perfect score by Greenpeace[10], and has also received the Belgian Financité-label for solidary financing[11].

FIGURE 2. ECOPOWER COMMUNITY WITH PV INSTALLATION (SOURCE: FRIENDSOFTHEEARTH.EU).

The cooperative activities include energy production from wind turbines, solar panels in solar parks and rooftops, and small water turbines, as well as energy supply to its members within the Flanders region. Ecopower also owns and operates a factory to produce pellets and briquettes from locally-sourced wood, supplying Belgium and the Netherlands. The cooperative further wants to stimulate energy savings and energy efficiency, stimulating those via their fixed electricity tariff, but also providing services for monitoring energy use.

Ecopower contributes to the energy transition reducing GHG emissions (in 2020 they estimate having saved 65,000 ton CO_2)[12], it stimulates the local economy and it also brings benefits to its members via dividends (up to 6%) and a fixed tariff scheme without subscription costs that incentivises energy savings and can be favourable for people with low consumption or a reversing counter with solar panels. However, there seem to be no special conditions nor programs to engage vulnerable groups and give them access to cheaper green energy.

Organizational structure

Ecopower is a cooperative under Belgian law, and can be classified as a CEC following the definitions of the European Clean Energy Package. As it has members from all over Flanders, it is unclear whether it could be classified as a REC, depending on the interpretation of the Flemish government of the concept of proximity defined in RED II (Hannoset et al., 2019). The cooperative's main seat is in Berchem, close to the Belgian city of Antwerp.

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[10] Ecopower - Greenpeace klassement - Bekijk de score van je leverancier (mijngroenestroom.be)

[11] Ecopower - Label Finance solidaire (solidairefinancieringslabel.be)

[12] Aandelen kopen · Ecopower

Any natural or legal person can become a member of the cooperative by purchasing one share of €250, and agreeing to the articles of association, the internal regulations, the privacy policy, and any other charters or commitments of the cooperation. The membership, however, may be rejected by the Board of Directors with the appropriate motivation. There is also an upper limit of 20 shares per member. The shares can be sold back 3 years after their purchase.

Decision-making bodies include:

- The Board of Directors is composed of 3 to 12 members that are appointed by the General Assembly for a period of 6 years. It is responsible for day-to-day management of the cooperative, legally represents it, and among others decides on the acceptance of new members.
- Control over the cooperation and its financial situation and annual accounts is exercised by one or more controlling members or, if necessary, by a supervisory director appointed by the General Assembly for a term of 3 years.
- The General Assembly of all members is taking place at least once a year, and participants can also join electronically. There is generally no minimum attendance required and a simple majority for more decisions, except for changes to the articles of association and/or the dissolution of the cooperative society, for which 10% attendance and 75% majority are necessary.

Ecopower has payment schemes for citizens that would like to become member but cannot easily afford it. Though, it still requires to pay the membership fee.

Barriers

Ecopower has a sound business case and its concept can be replicated as such. In a report of the European Commission BRIDGE initiative (Hannoset et al., 2019), some barriers that the cooperative is facing were examined, included the following.

- There is a competitive advantage for large companies to contract the use of interesting land for wind turbines. Though, this barrier was not confirmed by other citizen driven initiatives.
- It is difficult to build a business case for PV projects on larger roofs, which results in suitable roofs are not used to the maximum. This barrier does not specifically link to energy communities. Any organisation who would develop PV on a large roof, would face the same challenge.

Enablers

Some of the conditions that made the initiation and growth of the cooperative energy community possible are summarised in the following (Hannoset et al., 2019).

- Investment subsidies were obtained for the first watermill renovation projects from the former monument care service (4.5 million Belgian francs, i.e. €110,000).
- The creation of the Flemish Organization for Sustainable Energy Flanders (ODE-Vlaanderen) facilitated lobbying for support mechanisms.
- A beneficial tariff was negotiated with Iverlek/Electrabel in 1995 for the sale of their electricity for 2 Belgian francs per kWh, allowing the cooperative to expand their production installations.

- The introduction of the green power certificates in 2003 enabled Ecopower to increase its facilities and production.
- Joining the market as an energy supplier further allowed Ecopower to grow.
- Ecopower's values of energy democracy, social justice and sustainability allowed for it to differentiate from competition early on.

ElektrizitätsWerke Schönau eG, Germany

Schönau im Schwarzwald is a small town of 2,425[13] inhabitants in South Germany, close to the borders with France and Switzerland. Though small, it has gained attention nationally and internationally for hosting a community initiative that became the first 100% renewable energy supplier in Germany.

History

The ElektrizitätsWerke Schönau eG (EWS) community energy cooperative started as a simple association of concerned parents against nuclear energy after the 1986 Chernobyl disaster, called the "Parents for a nuclear-free future" association (Eltern für atomfreie Zukunft, EfaZ e.V.). The association initially took a positive approach to promoting clean and carbon-free energy, organising fun events to engage the local community.

However, as the local monopoly on energy supply, which also had control of the distribution grid, would not accept to cooperate with the association and support actions to save energy and to pursue environmentally friendly power generation, the association decided to take matters in their own hands, take over the grid and produce their own energy. Thus in 1990, the association established Netzkauf Schönau GbR, a civil law partnership that aimed to take over the distribution grid and stop the renewal of the contract with the incumbent energy supplier. In 1994, also the community energy cooperative Elektrizitätswerke Schönau (EWS) was set up by the association to serve as the energy supplier. Following fierce communication complains from both sides and two referenda of the local community, the municipality finally decided to grant the concession for supplying energy to EWS in 1996.

In order to acquire the distribution grid, the association counted on support from not only local citizens, but also community banks, NGOs, communication agencies and individuals nationwide. An important part of the multi-million purchase was covered by a nation-wide fundraising campaign, promoted often free of charge by newspapers, tv and radio channels. On 1st June 1997, the cooperative officially took over the town's power grid and energy supply management.

When the electricity market opened up in 1998 in Germany, EWS quickly multiplied its customers, who could choose them as a supplier from different parts of the country. In 2009, the legal structure was changed, whereby *Netzkauf EWS eG,* the civil law partnership, was transformed into a cooperative and became the owner of EWS, making the integration of new members easier.

13 Key data on the population - Statistisches Landesamt Baden-Württemberg (statistik-bw.de) (in German), data for 2020.

FIGURE 3. COFOUNDERS OF THE "PARENTS FOR A NUCLEAR-FREE FUTURE" ASSOCIATION, URSULA SLADEK AND DR. MICHAEL SLADEK[14].

The present-day EWS cooperative

Since EWS was founded in 2009, the cooperative has steadily grown to count around 9,600 members in 2020 (see Figure 4), and supplies more than 200,000 customers with 100% renewable energy, including not only electricity but also biogas since 2015. EWS has won several awards and prizes for its activities, among others the European Solar Prize, the Nuclear-Free-Future Award and the German Founder's Award[15]. The cooperative is committed to the energy transition and strives for a complete and efficient energy supply based on renewable energies.

Its activities have as a foundation civic engagement, co-determination and decentralisation, and include electricity production (solar, wind, combined heat and power, biomass), electricity, heat and gas distribution, electricity and heat supply, bio and natural gas supply, B2B & B2C services, public utility services, energy saving services and electro-mobility services. Further, the cooperative also tests new technologies in pilot projects, for instance integrating digital technology, organises workshops and provides information material. Finally, through a small subsidy component in its tariffs, EWS maintains a funding program to support clean citizen-owned power generation, energy efficiency projects, education, awareness campaigns, global energy justice programs as well as local energy pilot projects.

Other than offsetting the environmental impacts of nuclear power and other fossil fuels that its renewable energy is replacing, EWS also provides social and economic benefits for the local community. In Schönau im Schwarzwald, EWS is one of the largest employers and tax contributors, it stimulates the

[14] https://www.ews-schoenau.de/

[15] The history of the electricity rebels | EWS Schönau (ews-schoenau.de)

local economy for instance related to works on the distribution grid, while it also invests in new production facilities and technologies as well as other community facilities. Members of the cooperative furthermore appreciate the sense of community EWS creates by gathering people with the same interest in the energy transition (Hannoset et al., 2019). It is however not clear whether specific attention is paid to engage vulnerable households and facilitate their participation in the cooperative.

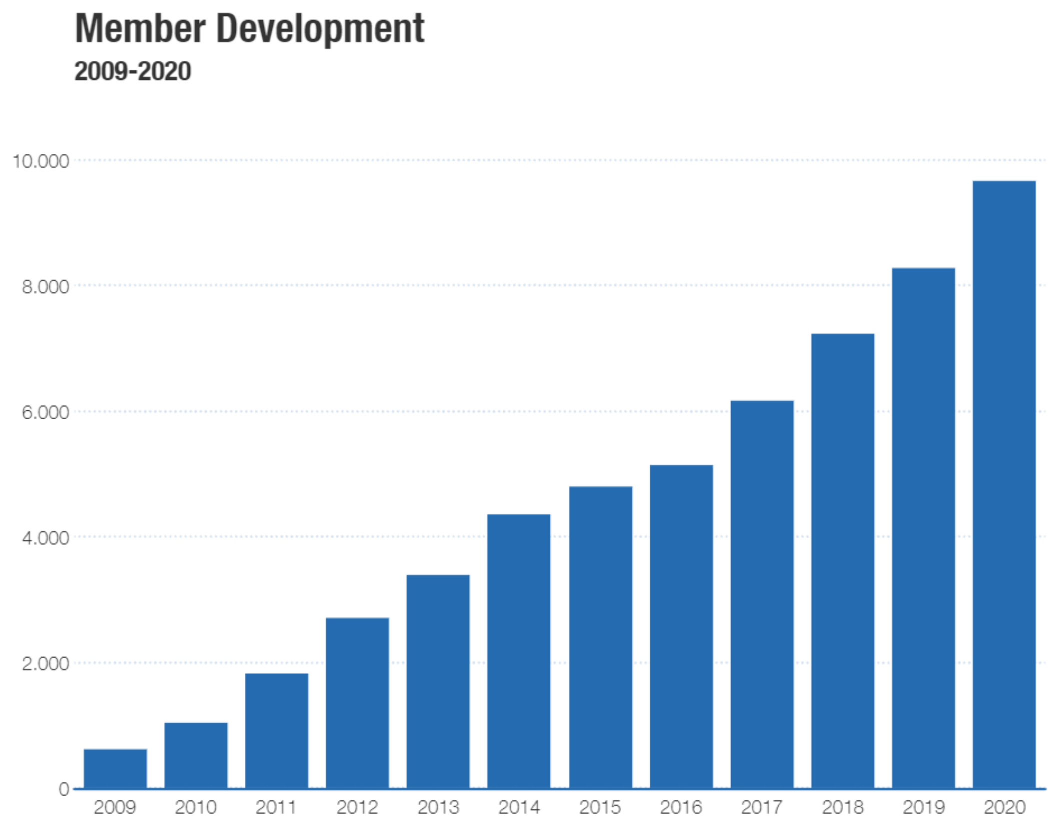

FIGURE 4. EVOLUTION OF MEMBERS OF THE COOPERATION SINCE 2009. SOURCE [HTTPS://WWW.EWS-SCHOENAU.DE/](https://www.ews-schoenau.de/).

Organizational structure

EWS eG has four limited liability subsidiary companies (GmbH), which are active in various activities including production and supply of energy with different technologies, distribution of energy and management of the grid. EWS also has holdings of more than 20% in three other energy companies, and a smaller percentage in various other sustainable cooperatives or civil initiatives. It is further also involved in renewable energy production projects. The seat of the cooperative is registered in Schönau im Schwarzwald.

Participation to the cooperative is open to natural and legal persons and partnerships, but it is subject to a number of conditions and approval from the Board of Directors. Among others, the purchase of at least 5 shares (of €100 each) and the signing of an unconditional declaration of accession are required. There is also an upper limit of 10 shares per member. Termination of the membership can be initiated by the member, subject to 3-year notice period.

Decision-making bodies include:

- The Board of Directors is composed of at least 2 members (currently 3), it manages the cooperative, legally represents it, and among others is responsible for the admission of new members.
- The Supervisory Board is composed of at least 3 members (currently 7), and it is elected by the General Assembly, with, 3 years term of office. The main task of the Supervisory board is to monitor the decisions of the Board of Directors.
- The General Assembly gathers all members of the cooperation annually to decide on a variety of issues, including electing the Supervisory Board and approving the actions of the Board of Directors and the annual accounts. Decisions are made by simple majority, except for special decisions like amendment of the Articles of Association, where 75% majority is required. Each member has one vote, and voting is generally open.

Barriers

Some of the barriers the cooperative faced and is still facing were summarised in a report of the European Commission BRIDGE initiative (Hannoset et al., 2019), particularly examining their relation to the new Clean Energy Package. These barriers included the following:

- A cap on the access of renewable resources to the German transmission grid until 2025 due to stability concerns is preventing EWS from expanding its production.
- It is difficult to compete against large companies for subsidies in Germany, because they are organised in auctions favouring the bidder with the least need for subsidies. Furthermore, because of the previously broad definition of a “citizens’ energy company”, larger energy companies could also benefit from favourable discounts in deposits for the auction intended for the former, by using proxy-communities through innovative structures. It is expected that the new REC and CEC definitions may address this issue.
- It is difficult to compete for the concession to operate a distribution network, as the financial and technical criteria used for the assessment favour the incumbent operator, who already has a financial plan and a professional team.
- With regards to its further expansion, and the inclusion of members from outside the area, has created some concerns among the villagers with regards to having others co-deciding on aspects impacting the local village.

Enablers

Despite the various hardships the cooperative faced in its earlier days and the challenges it still faces now to expand and compete with larger players, EWS has developed into a successful example of a LEC. Some of the key factors enabling its emergence and consolidation are the following.

- The initiative started by respected members of the local community, who had good knowledge of the location and people.
- There is strong community cohesion, as Schönau im Schwarzwald is a small town where everyone knows each other.
- The fun and proactive approach to the initiative helped gain the support of the community in the initial stages and maintain it.
- Expertise in the electricity sector at the starting phase of the initiative was paramount to take on the operation and management of the local distribution grid.
- The citizen-organized referenda were crucial for the association’s plans to take over the distribution grid, as they showed to the municipality what the wish of the local community was.

- A well designed and widely supported by national media fundraising campaign was the push needed to gather the necessary financial resources for purchasing the local distribution network. The media attention was particularly important for attracting the necessary interest. The fact that this was the first of its kind David vs Goliath battle played a key role in this.
- The policy framework in Germany has been favourable for EWS, starting already from the liberalisation of the electricity market that allowed them to expand nationwide and increase their source of revenue. Furthermore, Germany's nuclear phase-out plan by 2022 has promoted the shift to renewable power in the country in general. Finally, the Renewable Energy Sources Act offered renewable energy producers a guaranteed income by introducing in 2000 a subsidy scheme based on feed-in-tariffs.

Amelander Energie Coöperatie U.A., The Netherlands

The Netherlands is home to many local energy initiatives. The knowledge sharing platform Hier Opgewekt reported 623 citizen collectives in 2020, many of which are energy cooperatives[16]. Because of the high ratio of fossil fuels in the Dutch electricity mix, locally produced electricity from renewables has seen great interest by the citizens (Vernay & Sebi, 2020). One of those is also the Energy Cooperative of Amelander.

FIGURE 5. THE AMELAND SOLAR FARM[17].

[16] Lokale Energie Monitor 2020 | HIER opgewekt
[17] http://www.amelandenergie.nl

Background

Ameland is a municipality and the third major island of the West Frisians, off the north coast of the Netherlands. It counted about 3,750 inhabitants in 2020[18]. Amelander Energie Coöperatie (AEC) was founded in 2009 by members of the local community, with the purpose of contributing to the sustainable development of Ameland and to make the municipality CO_2 neutral by 2020 (Hannoset et al., 2019). The cooperative is concerned with awareness raising over energy issues, promotion of energy saving measure, production and delivery of locally generated sustainable electricity from renewable sources and of CO_2-compensated gas. Today the cooperative counts more than 300 members and about 1,200 customers[19].

The cooperative owns a third (together with the municipality and energy supplier Eneco) of one of the largest solar parks in the Netherlands, which consists of 23,000 solar panels, producing approximately 6.7 GWh a year, enough to cover the needs of 1,900 households.[20,21] AEC estimates that the solar farm has contributed to the avoidance of about 19,000 tonnes of CO_2 emissions. Since 2021, the electricity generated from the solar park is supplied entirely to local customers via the cooperative energy supplier Energie van Ons, who is a provider of 100% local green energy, while previously the electricity contract for the solar farm was with Eneco.[22] In 2021, AEC also launched an action for members to invest in the collective purchase of solar panels, which are installed by the cooperative on the roofs of companies in the municipality[23].

Organizational structure

AEC is a cooperative, and it can be classified both as a CEC and a REC according to the Clean Energy Package Definitions (Hannoset et al., 2019).

Anyone with ties to the town of Ameland can become member of AEC by purchasing at least one member certificate of €50, with a maximum of 500 certificates per member. The membership can be terminated with a 2-month notice period. For certain actions, members need to reside in Ameland or nearby, in order to take advantage of postal code-based schemes for solar panels, for instance. Clients of AEC need not be members of the cooperative.

Decision-making bodies include:

- The Board of Directors handles the day-to-day business, such as contacts with the customers and energy suppliers, keeping up with the energy market and sustainability projects. The Board of Directors consists of five people who were the initiators of the cooperative and were thus never elected for the position.
- There is also a Supervisory Board whose tasks include the supervision and appointment of the Executive Board.
- The General Assembly of all members is organised annually to discuss the general policy of the cooperative, and exercise control over the annual statement and profit distribution. Its powers are set out in the articles of association or per convocation. Each member has one vote, and a simple majority is required unless the articles of association specify otherwise.

[18] StatLine - Bevolkingsontwikkeling; regio per maand (cbs.nl)
[19] http://www.amelandenergie.nl
[20] Zonnepark op Ameland is 's lands grootste | HIER opgewekt
[21] AEC | Amelander Energie Coöperatie | Nieuws | Zonnepark (amelandenergie.nl)
[22] Electricity contract solar park Ameland goes entirely to Energie VanOns - VanOns
[23] AEC | Amelander Energie Coöperatie | Nieuws | Zonnepark (amelandenergie.nl)

Barriers

A barrier faced by the energy community relates to the disproportionate supply license requirements in the country (Hannoset et al., 2019).

- The license for electricity supply is linked to various technical and financial conditions (public service obligations, balancing services and security of supply). While this can be named a barrier, it is a logical requirement for large suppliers, and can be outsourced for smaller ones[24] (which comes with a cost). Though balancing is required, hence the need for it to be taken up as a responsibility.

Enablers

Some of the key elements that allowed the energy community to grow and be profitable include (Hannoset et al., 2019):

- Grants were obtained for the energy community's projects from the European Agricultural Fund for Rural Development, the province of Friesland, Leader and the municipality of Ameland.
- Collaboration with the energy supplier Eneco, who provided the know-how, and the city of Ameland was important for the development of the solar park.
- AEC was able to fully replicate the existing business model of Sustainable Energy Cooperative Schiermonnikoog U.A. on the nearby island of Schiermonnikoog.
- Until April 2021, the postal code scheme (*Postcoderoosregeling*) allowed members of a cooperative to receive an energy tax discount on their energy bill for the electricity produced by a common solar photovoltaic installation. The scheme was replaced by the Cooperative Energy Generation Subsidy Scheme (Subsidieregeling Coöperatieve Energieopwekking, SCE),[25] which is a subsidy per kWh produced given by the Netherlands Enterprise Agency, aimed to make renewable installations profitable for energy cooperatives.

[24] https://www.vemw.nl/~/media/VEMW/Downloads/Public/Nieuwtjes/Contouren%20Energiewet%2017jul20.ashx

[25] FAQ Subsidieregeling Coöperatieve Energieopwekking: De regeling in het kort | HIER opgewekt

Lessons Learned

The above assessment indicates that many of the often claimed barriers are not specifically barriers related to energy communities. Different sources mention barriers that are either no effective barrier, not specifically linked to energy communities, or justifiable. Many barriers are linked to the absence of an effective business case, often overcome by substantial public funding.

Several of the sources used, start by assuming and energy community has to be realized and consider it a goal rather than a means to get a more renewable, participatory and flexible energy system. Taking that angle away and looking at different ways to reach a goal also brings benefits for energy communities: they no longer stand alone in their "fight" against specific barriers. An example is the absence in most member states for participation of small scale assets in flexibility services, the slow roll out of digital meters, or the permitting for e.g. grid-connected storage and charging infrastructure. Teaming up with actors that also face these barriers or challenges, would create more leverage and could put more pressure on decision makers to enable change.

Another element that became apparent, is that none of the sources discuss the aspect related to dissolving the energy community. Though, this is an important element that might also impact the business case design.

4 Best Practices were finally discussed, including with regards to their replicability. Mature cases such as Ecopower, ElektrizitätsWerke Schönau eG (EWS) and the case of the Amelander Energi Coöperatie, are inherently replicable in their operation and have proven this, though could score better with regards to inclusiveness and multi-culturality. Cases such as Samsø are much less replicable, due to the exceptional funding received at the start and in the first years of its operation. It is important that the description and marketing of such exemplary cases provides a clear, fair and in-depth assessment of the conditions that applied when they emerged and further matured.

Finally, more attention could be given to cases that have contributed substantially to e.g. technology acceptance, but dissolved. The many Danish cooperatives formed around specific wind turbines about 3 decades ago, have helped technology advancement as well as citizen acceptance. The current market conditions do not allow enough profit guarantee to replace the old wind turbines under the structure of these citizen cooperatives, but their added value has been proven.

Abbreviations

AEC	Amelander Energie Coöperatie
CEC	Citizens Energy Communities
DER	Distributed Energy Resources

DSO	Distribution Systems Operator
EMD	Electricity Market Directive
EWS	ElektrizitätsWerke Schönau
LEC	Local Energy Community
RED	Renewable Energy Directive
REC	Renewable Energy Community

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