INTERACT

Integration of Innovative Technologies of Positive Energy Districts into a Holistic Architecture

D.5.1 Current regulatory framework and differences between the PED-target countries

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Executive Summary

The aim of the document is to briefly describe the current development of the regulatory framework relevant for the development of energy communities in four selected countries - Austria, the Czech Republic, Sweden, and Belgium.

The key to the development of energy communities is to anchor their status, particularly within national energy laws and subsequent secondary legislation. At EU level, the regulatory framework is defined by two crucial directives: The Renewable Energy Directive (EU) 2018/2001 (REDII) and the Internal Electricity Market Directive (EU) 2019/944 (EMD). These directives were recently adopted as part of the European Commission's Clean Energy Package and they provide the current definitions of energy communities by distinguishing between Renewable Energy Communities (REC) and Citizen Energy Communities (CEC), the implementation of which Member States were obliged to complete by mid-2021.

Now, it is difficult to fully evaluate and compare the different national regulatory frameworks relevant for the operation of energy communities, as the process of transposition into individual national legislation has not been completed in all countries. Among the four countries analyzed, only Austria complied with the obligation given by EU directives. In the remaining three countries, legislative proposals are being discussed. Final approval in Sweden and Belgium is expected within this year, while in the Czech Republic an even longer period of national implementation is expected.

The fundamental framework for the operation of energy communities is harmonized through EU directives. However, there can be considerable scope for variation in specific conditions at national level. For example, governance and membership issues such as control and autonomy, the definition of the relevant REC territory (i.e., definition of proximity and specification of physical boundaries) or ownership issues or existence of special distribution tariffs.

In Austria local distribution tariffs for energy communities has been introduced in 2021. The basic rule is that energy communities shall not cover costs for higher level grid parts in their work-based grid tariffs. Depending on the type of the energy community the potential savings on distribution fees can vary from 20 % (in case of CEC) to 50-60% (in case of REC, with differences depending on the location of specific REC within the topology of the distribution grid, see example for Lower Austria in Table 3).

In Sweden no special distribution tariffs are planned. On the other hand, there have been approved legislative changes that open possibility for building a local DC grid for local energy sharing without concession. It is the energy market directorate that decides on a case-to-case basis.

In the countries we the national implementation has not been completed we try to describe relevant conditions for potential prospective members of energy communities: consumers, producers/prosumer, and energy storage facilities and planned implementation strategies as far as information is available.

List of Figures

List of Tables

List of Abbreviations and Acronyms

aFRR	Automatic Frequency Restoration Reserve
CEC	Citizen Energy Community
CSC	Collective Self-Consumption
CWaPE	Walloon energy regulator
DER	Distributed Energy Resources
DSO	Distribution Service Operator
EAG	Austrian Renewables Act
EC	Energy Community
Ei	Swedish Energy Markets Inspectorate
ElWOG	Austrian Electricity Act
EMD	Electricity Market Directive (EU) 2019/944
ENTSO-E	European association for the cooperation of TSOs for electricity
EXAA	Energy Exchange Austria
FCR	Frequency Containment Reserve
GoO	Guarantees of Origin
kWh	Killowatt hour
kWp	Kilowatt-peak
LVG	Low Voltage Grid
mFRR	Manual Frequency Restoration Reserve
MVG	Medium Voltage Grid
MWh	Megawatt hour
REC	Renewable Energy Community
REDII	Renewable Energy Directive (EU) 2018/2001
SME	Small- and medium-sized enterprises
ToU	Time-of-Use
TSO	Transmission System Operator
VAT	Value added tax

Table of Contents

1. Introduction

1.1. Purpose of the document

The aim of the document is to present the current state of implementation of the legal framework governing the functioning of energy communities. We look at the European Electricity Market, both for electricity and ancillary services, and at the European regulations with respect to energy communities. For national legislation, the document focuses on countries partnering within the INTERACT project: Austria, Belgium, the Czech Republic, and Sweden. The document shall not perform a detailed legal analysis; it should serve as an introduction to the topic, and as a basis for the following analyses within the INTERACT project in regards of business cases and contractual necessities.

1.2. Relation to other project activities

The document "Current regulatory framework and differences between the PED-target countries" is the first of three deliverables of WP5. The outcome should serve as a starting point for the discussion about possible business cases D.5.2 "Business cases for the INTERACT energy community" and required contracting models in D.5.3 "Required contracting models and economic evaluation of the solution". The information regarding the current legal situation within the different participation countries and its approach and strategy on how to implement the European Directives also plays an important role for stakeholder-targeted dissemination activities in WP7 and the information in the country-specific versions of the roadmap for the implementation of INTERACT Energy Communities within WP6.

1.3. Structure of the document

Chapter 2 introduces readers to the European regulatory framework relevant to the Electricity market in general and energy communities specifically. Chapter 3 describes the current situation of transposition of European Directives into national legislation in Austria, Belgium, the Czech Republic, and Sweden, and in general the current legal situation within these countries in respect to energy communities. Chapters 4 and 5 address selected topics important for the realization of INTERACT Energy Communities: the relationship with the distribution grid operator for the technical integration of the solution in Chapter 4, and the position of energy communities and access to the energy market for the economical assessment and evaluation in Chapter 5. In Chapter 6 we outline main drivers and barriers in respect to a fast implementation and spread of energy communities. Chapter 7 summarizes the key findings and gives an outlook on upcoming changes and possibilities.

1.4. Methodology

We have used different types of tools to gather information involving (i) desk research of expert studies, relevant EU directives for energy communities, main regulatory framework in selected countries (Austria, the Czech Republic, Sweden and Belgium) (ii) discussion with experts from the academic sector (e.g. Ms. Jenny Palm, the University of Lund for Sweden),

the business sector (e.g. WeSmart in Belgium) and non-governmental sector (Unie komunitní energetiky and Svaz moderní energetiky, z. s., the Czech Republic).

At this point in time, a full evaluation and comparison between the different national regulatory frameworks relevant to the functioning of the energy communities is difficult, as the process of transposition into individual legislation is not completed. Of the four countries analyzed, only Austria has fulfilled the obligation under the EU Directives. In the remaining three countries, legislative proposals are under discussion. In the countries where national implementation is not completed, we try to describe the relevant conditions for the potential prosperous members of the energy communities: consumers, producers/ consumers and energy storage and give insight into the planned legislative changes as far as this information is available.

2. European Electricity Market

2.1. European energy regulatory framework transition towards liberalized internal energy market

As mentioned in November 2016 Briefing of European Parliament "Understanding electricity markets in the EU" (European Union, 2016), EU energy legislation is based on a 'target design model', where the overarching goal is the achievement of **an increasingly interconnected European electricity market with convergent prices across the EU**.

A liberalized internal energy market for gas and electricity has been established through three legislative packages adopted in the 1990s, in 2003 and in 2009:

- Directive 96/92/EC on the common rules for the internal electricity market,
- Directive 2003/54/EC which enabled new electricity suppliers to enter Member States' markets and allowed consumers to choose their electricity supplier, and
- Directive 2009/72/EC which further liberalized the market.

However, as the share of electricity produced by renewable energy sources is expected to grow and electricity has to be provided also when there is no wind or sun, the European Electricity market had to adapt further. Therefore, the EU adopted four pieces of legislation to tackle the issues related to the requested transition to green and clean energy (European Commission, 2022):

1. The Directive on common rules for the internal market for electricity (EU 2019/944) replaces the Directive 2009/72/EC.
2. The Regulation on the internal market for electricity (EU 2019/943) replaces the Electricity Regulation (EC/714/2009).
3. The Regulation on risk preparedness in the electricity sector (EU 2019/941) requires EU Member states to prepare plans for potential future electricity crises.
4. The Regulation (EU 2019/942) redefines the tasks of the EU Agency for the cooperation of energy regulators with additional competences.

A European scheme is also being set up to take full advantage of the flexibility of all resources. European Guidelines on Electricity Balancing (European Commission, 2017) pursues the objective of ensuring the optimal management and coordinated operation of the European electricity transmission system, while supporting the achievement of the Union's targets for penetration of renewables. We can mention two initiatives that are establishing international market for frequency balancing ancillary services. MARI[1] and PICASSO[2] are the TSOs' projects for establishing the European mFRR and aFRR platforms, two key deliverables of the European regulation establishing a guideline on electricity balancing.

[1] MARI = Manually Activated Reserves Initiative is the European implementation project for the creation of the European mFRR platform.
[2] PICASSO = European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation or aFRR-Platform

Both Austria and the Czech Republic are among the first countries to join these platforms by mid-2022. The Nordic TSOs (including Swedish one) are currently preparing their request for derogation. The detailed steps towards accession to MARI will be assessed as part of this process. The planned connection time is expected in the period Q4 2023 - Q2 2024. (see Figure 1 according to PICASSO-MARI stakeholder workshop, 2021).

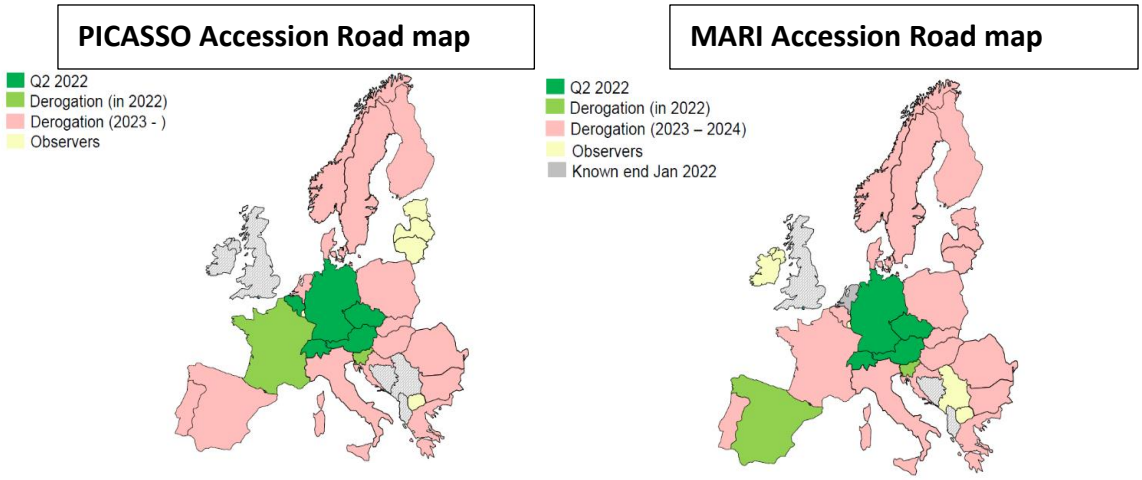

Figure 1: PICASSO and MARI Accession Road map

All the mentioned new rules aim to make the European electricity market better connected, better protected against black-outs, better capable to integrate renewable energy, more market-based and more consumer oriented.

Nevertheless, it can be expected that the European Energy Market will still encounter several transitions before clean and sustainable energy will be available for all Europeans as desired To mention some of them:

Further increase of renewables. The importance of renewables in the European energy mix still lags fossil fuels. The future trend to further increase will be driven not only by environmental issues but also energy self-sufficiency issues. As shown in Figure 2: Share of renewable energy in total energy available in % within the European Union (European Commission, Eurostat, 2022) varies significantly among member states, there is still a long way to go towards a clean and sustainable energy production for all Europeans. Based on the latest available data from 2019, the average share of renewable energy in total energy

available (gross inland consumption) is around 16%, and member countries range from not even 2% (Malta) to slightly above 40% (Sweden).

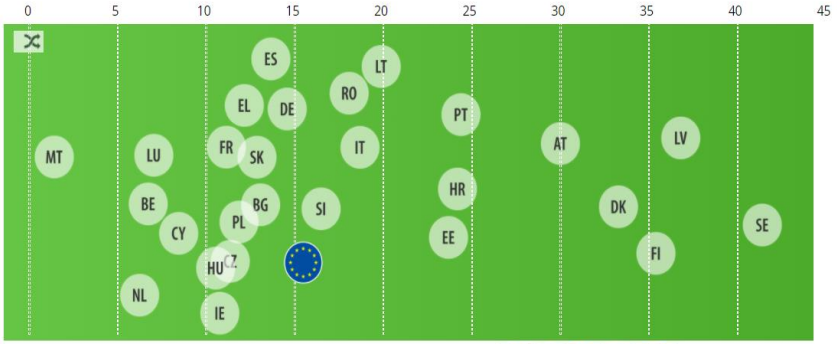

Figure 2: Share of renewable energy in total energy available in % within the European Union (2019)

With the further decarbonization of industry and transport (and not only because of it)**, electricity demand is expected to increase further.** All scenarios of the European association for the cooperation of TSOs for electricity (ENTSO-E) plan with a quick further increase on electricity demand within the next decades, making the transition to clean energy even more challenging. Further capacity increases necessary in the Transmission Network are identified throughout whole Europe, with a focus on western continental Europe (France, Belgium, Netherlands, Germany) and South-Eastern Europe, see Figure 3 (ENTSO-E, 2019).

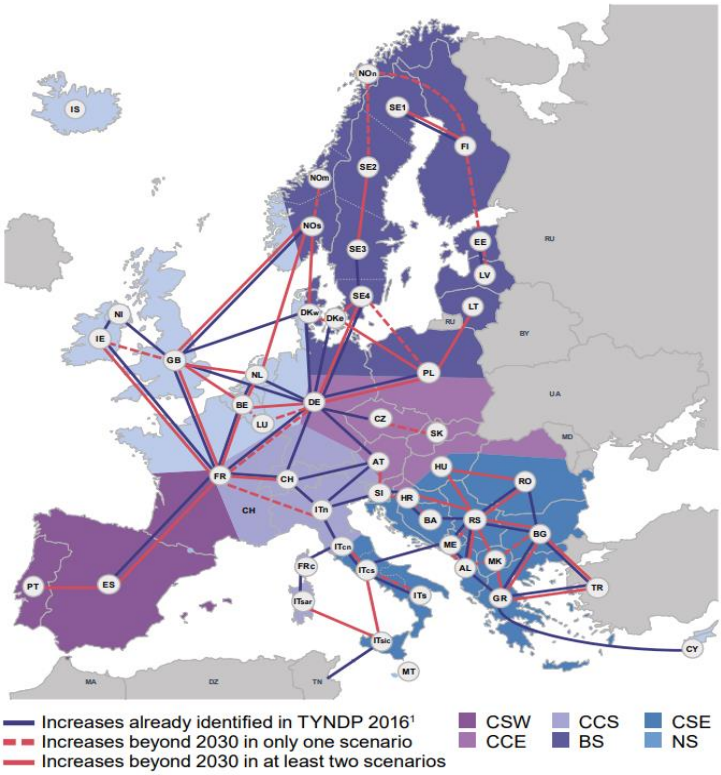

Figure 3: Summary of necessary capacity increases in the electricity grid based on the 10-year network development plan of ENTSO-E

However, even if electricity can move freely between European Union member states, **taxation is still a national competence, and pricing – even though realized through European Market Exchanges, varies between the different countries**. Next to different taxes on electricity from one country to the other, also different state aids exist in each country.[3] This can take the form of a percentage discount on the bill, or a lump sum attributed to each family or person. According to the type and amount of the discount, it can decrease the appeal and attractiveness for energy savings.

Nevertheless, even before the current rise of energy prices, based on the most recent available data from Eurostat from 2015, electricity gas and other fuels account for up to 8% of the household costs for lower income households in Germany, and about 5% of the average household within the Eurozone. Together with costs for personal vehicles, the cost block is the third largest after food and housing, see also below in Figure 4 (BNP Paribas 2022).

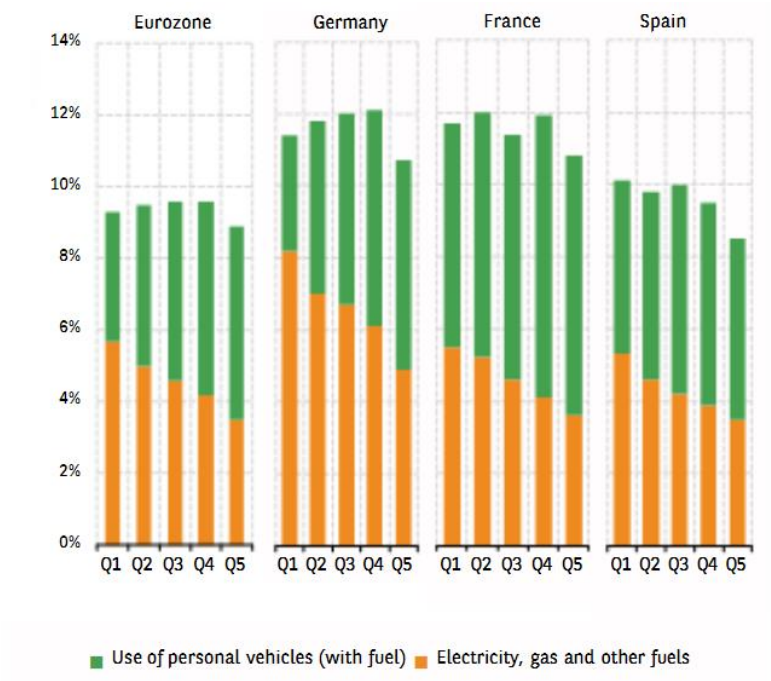

Figure 4: Share of Energy cost in total household consumption, per income quintile

Energy communities can make a positive contribution to addressing the above challenges by increasing locally produced and consumed renewable energy, effectively optimizing local energy demand and decreasing the usages of higher grid levels.

2.2. Energy Community Related Regulations

The Renewable Energy Directive (EU) 2018/2001 (REDII) and the Internal Electricity Market Directive (EU) 2019/944 (EMD) recently adopted as part of the European Commission's Clean Energy Package provide the current definitions of energy communities by distinguishing

[3] to help vulnerable consumers paying their bills, as access to electricity is recognized as a need for vulnerable households to have heating in winter.

between Renewable Energy Communities (REC) and Citizen Energy Communities (CEC), see visualization in Figure 5 (based on INTERACT project Deliverable D.3.1).

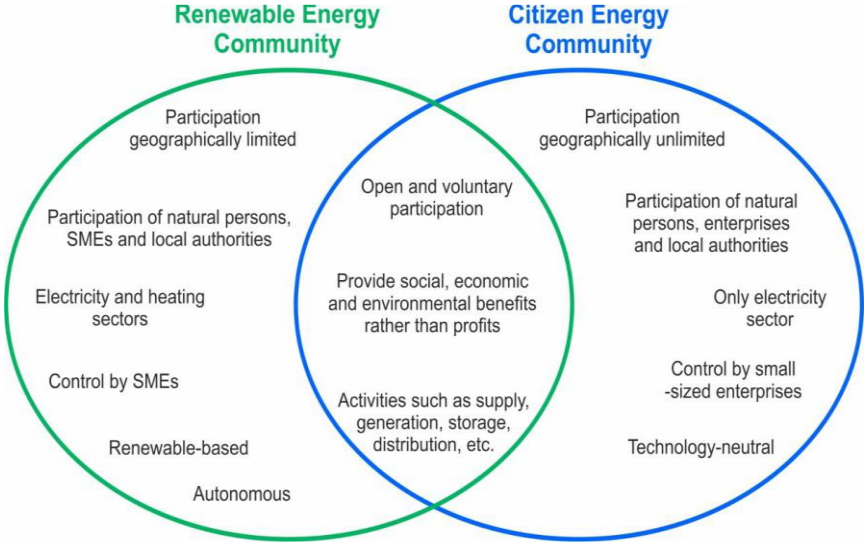

Figure 5 - Renewable and Citizen ECs according to EU legislation

EU Member States were obliged to transpose the provisions related to CEC (as set in the Electricity Market Directive (EMD)) by the end of 2020 and the provisions for RECs (as set in the updated renewable energy directive (REDII)) by the end of June 2021.

Participation in both types of energy communities is generally open and voluntary, while their purpose is to provide social, economic, and environmental benefits to the community members or shareholders rather than profits. Typical community activities include supply, generation, storage, distribution, consumption, sharing, and energy-related services.

Renewable Energy Communities are geographically limited and organized in the proximity of renewable energy projects owned and developed by that community. Natural persons, including low-income and vulnerable households, local authorities and small- and medium-sized enterprises (SME) may participate. RECs cover a broad range of activities referring to all forms of renewable energy in the electricity and heating sector. They are effectively controlled by SMEs while remaining autonomous from individual members and other traditional market actors who participate in the community as members or shareholders.

Citizen Energy Communities mainly differ from the renewable ones by their geographically unlimited character, their focus on the electricity sector, and their technology neutrality. Any actor may participate if members or shareholders engaged in large-scale commercial activity and for which the energy sector constitutes a primary area of economic activity do not exercise any decision-making power.

In addition to the concept of energy communities, it is worth mentioning the term Collective Self-Consumption (CSC). CSC stands for initiatives of joint generation and consumption usually within the same multi-apartment building. In many countries the CSC has been implemented as an initial stage before the full implementation of REC or CEC regulatory framework even before the finalization of the Clean Energy package. E.g., CSC concept was introduced in 2017

in Austria and is kept as a legal possibility for multi-tenant houses in parallel to the more recently introduced REC and CEC.

The REDII defines individual "renewables self-consumers" as well as "jointly acting renewables self-consumers" in Article 21. Jointly acting renewables self-consumers are defined as: a group of at least two cooperating "renewables self-consumers […] who are located in the same building or multi-apartment block". The frequently used term collective self-consumption (CSC) corresponds to "jointly acting renewables self-consumers".

CSC, RECs, and CECs are defined separately in the Clean Energy package. CSC represents an activity while energy communities focus also on organizational issues.

The regulatory framework defined on the EU level leaves many details of the transposition process to the national level. E.g., the governance and membership-related questions such as control and autonomy, the definition of relevant territory of RECs (i.e., definition of proximity and the specification of physical boundaries) or questions regarding ownership.

Oberthur, S. et. al. (2022) identified seven following partly overlapping issues related with the implementation on the national level:

a. Financial viability of the market design
b. High administrative burden and complexity of starting up and running a REC or CEC
c. Membership volatility
d. Risk of limited access to participation and lack of fair and transparent procedures
e. DSO status
f. Access to grids and direct lines
g. Consumer information and contractual rights

The status of the national implementation will be described in following Chapters for INTERACT partnering countries Austria, Belgium, the Czech Republic and Sweden.

3. Stage of implementation of Energy Community legislation

This section should answer following questions:

(i) Is the European legislation fully implemented? If not, what is the status?

(ii) Is it possible to create a renewable/citizen energy community?

The current stage of implementation is summarized in Table 1. CSC is also included and focus on joint consumption within one usually multi-apartment building.

Table 1: Current stage of implementation of Energy Community legislation in selected countries

		Definition implemented		
	Stage of implementation	**REC**	**CEC**	**CSC**
Austria	Implemented 07/2021	yes	yes	yes
Belgium	Draft proposal*	yes*	yes*	yes*
Czech Republic	Draft proposal	no	no	no
Sweden	Draft proposal	no	no	yes**

* The legislation is different for the 3 regions in Belgium (Wallonia, Flanders, Brussels).
** Collective self-consumption is allowed and implemented on several places in Sweden, mainly for putting PVs on multi apartment buildings. The term Collective self-consumption however is not commonly used and cannot be found in legislation.

3.1. Austria

Since the publication of the Austrian Eneuerbaren-Ausbau-Gesetzespaket / EAG-Paket (Renewables expansion package / EAG-package) on 27th of July 2021, the legal ground for the full implementation of the European Community legislation was granted. The EAG-package comprises of a complete new federal law – federal law regarding the expansion of energy from renewable sources (EAG 2021), and changes of nine federal laws related to the topic.

Legal provision related to energy communities are found mainly in two Austrian federal laws: above mentioned new EAG 2021, and the at the same time updated federal electricity act from 2010 (Elektrizitätswirtschafts- und -organisationsgesetz / ElWOG 2010, in its new 2021 version).

Provisions for renewable energy communities are covered within EAG 2021, provisions for citizen energy communities within ElWOG 2010. Furthermore, within ElWOG 2010 are also provision related to both energy community types, specifically provisions regarding measuring and invoicing, and rights and obligations in relation to the respective DSO.

The first step in the direction of Energy Communities was already done in 2017 in Austria, when an update of the ElWOG 2010 was allowing the establishment of Photovoltaic installations on multi-tenant apartments for their respective self-consumption under the umbrella of an operating organization, e.g., an association or another legal entity. The property border is set as a physical limit for the concept. The concept is called Collective Self

Consumption (CSC) and is based on a set of contracts between all participating parties, see Figure 6 (PV Gemeinschaft, 2022): DSO ("Netzbetreiber") with Operator of the PV-installation

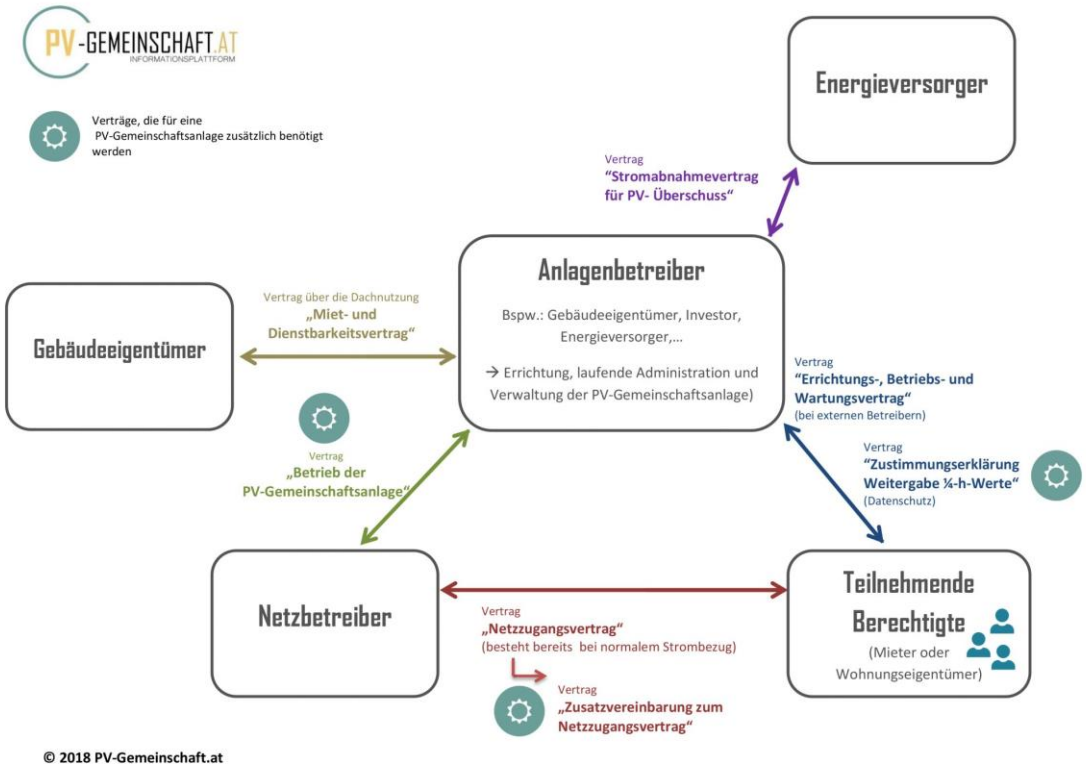

Figure 6: Contractual relations of a community self-consumption installation in Austria

("Anlagenbetreiber"), DSO with each entitled Consumers ("teilnehmende Berechtigte"), Operator of the PV-installation with each entitled Consumer, Energy Supplier ("Energieversorger") and Owner of the building ("Gebäudeeigentümer"). CSC is not to be mixed up with Energy Communities and is kept as legal possibility for multi-tenant houses in parallel to the more recently introduced REC and CEC. Several states of Austria have special funding programs for CSC in accordance with §16a ElWOG, in addition to the regular funding programs for other types of DER.

With the EAG-package not only the legal base for the implementation of REC and CEC in the sense of the European Green Deal has been enabled, but also a centralized information point for the implementation of Energy Communities has been established, the Austrian Coordination Point for Energy Communities (Österreichische Koordinierungsstelle für Energiegemeinschaften – www.energiegemeinschaften.gv.at). The portal is bringing together the information from the nine service centers of all Austrian states, and the complete federal information regarding legal and operational aspects with the aim to facilitate and ease the implementation and operation of Energy Communities and to make them an indispensable part of the electricity market of Austria.

Based on the status report of the Austrian Coordination Point for Energy Communities, as of December 2021, (ÖKfEG 2021) all legal requirements are given to found and operate an energy community. The update of the grid tariff regulation (Systemnutzungsentgelte-Verordnung) from 1st of November 2021 was defining the reduction of the grid fees for Energy

Communities. In Austria RECs can only be implemented within the area of one DSO and can be either implemented as local RECs in LV-grid (transmission level 6/7), or as regional REC in MV-grid (transmission level 4/5) (ÖKfEG 2022).

Due to technical restrictions and IT-process changes, energy communities with more than one producer must currently accept a transitional solution, where each consumer will be aligned to a single producer. Based on the timeline agreed by Österreichs Energie, the special interest group of Austrian Electricity sector, latest by the 3rd quarter of 2022 these interim alignment between producer and consumer shall be automatically eliminated by the DSOs and the proposed standard operations enabled (ÖKfEG 2021).

Based on §79 (3) EAG 2021, the regulating body must perform a cost-benefit analysis of the proposed regulations regarding energy communities, where the main focus shall be laid on the question, whether Energy Communities are participating in a fair and harmonic way in the costs of the energy system including costs of balancing energy. This should be elaborated by the end of 2023.

3.2. Belgium

In Belgium, there are differences among individual approaches of by Flemish, Walloon, and Brussels regions. Energy communities, energy efficiency, and renewable energy implementation are handled on a regional level due to the regional government structure in Belgium. The implementation of REC and CEC has not been finalized in all regions.

In Wallonia, CSC has been implemented into the regional legislation in 2018, followed by introduction of RECs in 2019. The legislation introduced in 2019 lays down the basic principles of REC. However, this regime is not immediately applicable, its implementation requires the prior adoption of implementing measures by the Walloon Government as well as the approval by the CWaPE (Walloon energy regulator). The legislation is in its last reading in government. This should be finalized in the coming weeks and be applicable in May/June 2021. Today, energy communities can be created as pilot projects if they are sufficiently innovative.

According to Frieden D. et al. (2020) the law defines a "local perimeter" as a grid segment whose connection points are located downstream of one or more stations of public electricity transformation of medium and / or low voltage. The REC can delegate the management of its activities to a third party. The REC does not require a supplier license, except if it is mandated by its participants to sell the excess energy to actors outside of the local perimeter. The law defines “network managers” that implement, according to the regulated tariffs, the technical, administrative, and contractual conditions necessary, in particular with regard to electricity metering. The DSO can be mandated by the REC to manage its closed distribution network. Grid tariffs for the use of the public grid will be determined by the regulator. The participation in a REC excludes self-producers from the net-metering regime accessible to private self-consumers (Frieden D. et al. 2020).

Peeters, et al. (2021) is mentioning several projects in Wallonia acting as regulatory sandboxes (e.g., Zelda or E-Cloud). In Wallonia, ECs, as self-producers, are exempted from the traditional

suppliers' obligations to buy renewable certificates, hereby, creating savings on the electricity costs.

In Flemish and Brussels region the legislation should be published within this year. No more pilot projects are accepted since the legislation is ready.

According to Peeters, et al. (2021) it is expected that the Flemish implementation will not provide any reductions on taxes, levies, DSO and TSO costs, nor on VAT (VAT is a federal matter), unless the regulator would rather unexpectedly identify cost savings through the behavior of energy communities and collective self-consumption.

The Brussels Capital Region has also introduced a concept of CSC in 2018 - one or more producers with one or more final consumers under the same legal entity, whose meters are under the same MV/LV substation. Thus, the Brussels Capital Region is, besides France, one of the few exceptions where collective self-consumption requires a formal organization as a legal entity Frieden D. et al. (2020).

3.3. Czech Republic

Legislative changes concerning the implementation of RECs and CECs in the Czech legal framework have not been finalized. The CSC concept is not enabled either.

There are expert working groups preparing for implementation into the Czech Energy Act and relevant regulations of the Energy Regulatory Office. The regulator envisages the introduction of the CSC concept in 2023 by amending only secondary legislation (decrees of the Energy Regulatory Office). The full implementation of REC and CEC in the Energy Act is delayed and should take place later.

3.4. Sweden

Legislation proposing transposition of RED II and EMD has been drafted in several different documents. The main proposals are found in:

- Clean energy within EU (Energimarknadsinspektionen, 2020)
- Electricity market regulation (Regeringskansliets, 2017)
- Modern processes for grid concession (Statens Offetliga Utredningar, 2019)

The final proposal is named "Implementation of the Electricity Market Directive when it comes grid activity" (Regeringens proposition 2021/22:153) and incorporates the proposals from all the documents above.

Prior to this legislation a separate law was passed, (SFS 2021:976) introducing a possibility to exemption from the requirement for a grid concession. This change in legislation opens for building a local DC grid for local energy sharing without concession. The legislation was passed in late 2021 and is valid from 1/1/2022. It is the energy market directorate that decides on a case-to-case basis if the proposed DC grid is subject to concession or not and since there has been very few cases so far there is little guidance on how the directorate interprets the legislation. This change in legislation was partially made to facilitate the local sharing of energy in energy communities or similar organizations.

In the Clean energy within EU report there where several proposals for legislative changes defining the organization and structure of an energy community. These suggestions are not a part of the final proposal. Under the headline Energy communities in the proposal the legislator states that there are no current barriers for forming Energy communities. In the comments to the legislation, it is mentioned that this might change in the future if specific legislative issues arise that hinders energy communities to contribute to increased consumer power, sustainability, or efficient use of energy. But legislative changes will in this case concern the operations of an energy community not the organizational form or structure.

Collective self-consumption is allowed and implemented on several places in Sweden, mainly for putting PVs on multi apartment buildings. The term Collective self-consumption however is not commonly used and cannot be found in legislation. The main limitation on this arrangement is that electricity is only allowed to be shared within the same building under the prerequisite that this building is served by the same connection point. To facilitate such an arrangement an economical association is usually formed within the building. The association then serves a counterpart to the DSO and the electricity supplier. Within the building separate meters for each apartment is used to divide the costs internally. And since all inhabitants are represented in these associations the freedom to choose electricity supplier is kept.

4. Energy community and DSO

This chapter focuses on the DSO's relationship with REC, particularly in data provision and the possible existence of special distribution tariffs. In countries with pending legislation, we focus on the relationship of the DSO to each potential member of the energy community.

Some EU countries are developing or have in place local electricity tariffs specifically for RECs or collective self-consumption (Austria, Portugal, France) while others have plans to develop new tariffs in the future (Spain, Belgium, Denmark) (see Peeters et al., 2021).

Table 2 summarizes the current situation within four analyzed countries. Among them only Austria has already established transparent legal framework for DSO-EC interaction. In Belgium distribution fees and some tax components may also be reduced. But it is dependent on the region and the rules have not been standardized yet. In Sweden there are no special distribution tariffs for ECs, and none are even suggested in the proposal put forward. In the Czech Republic it is also not clear yet, the Energy Regulatory Office will analyze the situation on selected pilot projects or regulatory sandboxes.

Table 2: Current stage of implementation of legal framework between DSO and energy communities in selected countries

	Austria	Belgium	Czech Republic	Sweden
Special distribution tariff for REC	Yes	Not standardized, depends on each region	Not known	Not planned
Legal framework between DSO and REC established	Yes	No	No	No

4.1. Rights and obligations

4.1.1. Austria

DSOs are key partners during the implementation and operation of EC's projects. In both European Regulations (2018/2001 and 2019/944) is stated, that the responsible DSO must cooperate with energy communities to facilitate the power flow within the community. Based on ElWOG 2010 (§16b-e), all Austria grid users have a right towards the DSO to participate within an energy community (REC or CEC).

DSO must inform within 14 days, at what connection point within the power grid the producer or consumer assets can be connected.

DSO must meter the electricity consumption and production (inflow and outflow to the grid) depending on the size of the electricity asset either with load profile meters or with smart meters. The installation must be done within 2 months, and must be fully operational within 6 months, on cost of the DSO.

DSO must take care of information security and state-of-the-art authentication methods on the related web-portals.

DSO must allocate the electricity production and consumption between the members of the Energy Community members based on the respective agreed static or dynamic shares.

Furthermore, the DSO must report the received information regarding Energy Communities without delay to the Austrian regulation authorities.

4.1.2. Belgium

DSO approves REC projects. They can disapprove a REC project, but the final decision comes to the regulator (Brugel for Brussels, CWAPE for Wallonia and VREG for Flanders). DSO has the responsibility the divide the global participant's consumption between self-consumption (to be invoiced by the community manager) and offtake consumption (to be invoiced by traditional energy provider). DSO has the obligation to provide energy flows every month to the community manager and adapted offtake consumption to the participants energy providers. The distribution key (dispatching algorithm of the injection between consumers) is agreed by the DSO and the community.

4.1.3. Czech Republic

DSO are obliged to provide on request data about distribution grid structure and connection options and conditions for all types of applicants (producers/consumers/energy storage facilities) no special treatment for REC.

Most of the small energy consumers have still metering provided on the yearly basis. The roll-out of smart meters is planned for 2024 for consumers with annual consumption higher than 6 MWh.

4.1.4. Sweden

DSO are obliged to provide on request provision of data about distribution grid structure and connection options and conditions for all types of applicants (producers/consumers/energy storage facilities) no special treatment for REC.

For energy user with a capacity of less than 63 A the DSO is obliged to deliver data on hourly based consumption, if this is requested by the consumer. No extra fees are allowed for this data supply.

4.2. Distribution tariffs for energy communities

4.2.1. Austria

Distribution tariffs are regulated in Austria in a special grid tariff regulation (Systemnutzungsentgelte-Verordnung), which was updated on 1st of November to define the tariffs for Energy Communities for the first time based on the §52 (2a) of ElWOG 2010, which was introduced with the new EAG-package in 2021.

The basic rule is that energy communities shall not cover costs for higher level grid parts in their work-based grid tariffs. For local RECs, which are situated in the LVG on grid level 7, the higher-ranking grid levels 1-6 will be excluded from the calculation. For regional RECs, which are situated in the MVG on grid level 5 (e.g., wind turbines), the higher-ranking grid levels 1-4 will be excluded from the calculation, and levels 6-7 to not apply, as the energy asset is connected to the MVG. Thus, only grid level 5 will be considered for the calculation. For CEC, it is defined that they are situated on grid level 5, as they can spread over the whole country. So here Grid Levels 1-4 will be excluded from the calculation, and 5-7 considered for the tariff.

Within the explanations document (E-Control, 2021) published together with the update of the grid tariff regulation, Austrian regulator e-control was giving three calculation examples based on the actual grid tariffs of 2021 for Lower Austria (see Table 3).

Table 3: Calculation examples of savings in the part of fees - Lower Austria

	Example 1 – Local REC on LVG	Example 2 – CEC	Example 3 – Regional REC on MVG:
Grid Fee Standard Usage	4.45 Cent/kWh (Level 7)	4.45 Cent/kWh (Level 7)	0.87 Cent/kWh (Level 5)
Grid Fee REC	1.91 Cent/kWh (Level 7)	3.2 Cent/kWh (Level 7)	0.31 Cent/kWh (Level 5)
Savings on the part of the fees	57%	28%	64%

Source: E-Control (2021)

4.2.2. Belgium

The main financial gain associated with the communities comes from the commodity price, which is lower for consumers buying energy, and potentially higher for producers selling their energy to the community.

Depending on the project and the region, transport fees (Elia in Belgium) can also be reduced or completely removed. Distribution fees and some tax components may also be reduced. All this is not yet standardized and depends on the region. No reduction will be applicable in Flanders and Wallonia. Some will be in Brussels depending on the electrical configuration of the energy community.

4.2.3. Czech Republic

With missing legislative framework for energy communities there are no special distribution tariffs in place. We see two trends in the market that try to solve the situation of the lack of legislation for the creation of energy communities. Both trends are motivated by potential savings of distribution costs:

(i) A growing trend is the practice of establishing local distribution grids for industrial and commercial premises, which is motivated by saving distribution costs. Members of the local distribution grid can access cheaper electricity from connected local power generation plants,

but the administrative requirements for local distribution grid operators are very high, limiting the mass roll-out of this institution.

(ii) On the residential sector side, many cases of clustering of grid connection points within a residential building can be observed. By doing so it is created a pseudo-CSC situation by establishing a main grid connection point followed by a cluster of secondary conditional grid connection points. However, these secondary connection points are subsequently dependent on the main connection point with an unequal position in the energy market, e.g., the Energy Regulatory Authority is trying to address this situation through decrees and the introduction of a real CSC in the regulatory framework in 2023.

4.2.4. Sweden

There are no special distribution tariffs for ECs, and none are suggested in the proposal put forward. In the proposal for legislation Ei identifies art.22 in the renewable energy directive which states that the DSO must cooperate with EC to facilitate energy distributions in the EC.

Ei does the assessment that this is covered in the Swedish “ellagen” (electricity law) that states that the DSO is obliged to connect and transfer energy for the benefit of third part, within reasonable limits. The law states that:

“Anyone who has a network concession for an area (the DSO) is, unless there are special reasons, obliged to connect an electrical installation within the area to the pipe network on reasonable terms”

and

“Anyone who has a grid concession is obliged to transfer electricity on behalf of others on reasonable terms.

The transmission of electricity must be of good quality.

A network concessionaire is obliged to remedy deficiencies in the transmission to the extent that the costs of remedying the deficiencies are reasonable in relation to the inconveniences for electricity users that are associated with the deficiencies.”

The maximum tariffs for DSOs in Sweden are decided by Ei in 4-year intervals. These tariffs are assumed to be applicable to EC in the same way as they are for single consumers today. The tariffs relate to consumed electricity from the grid for producers there are specific Feed in tariffs. A DSO is obliged to accept feed in from micro producers if these consumers are net consumers over one year. If the micro producer is a net producer, the DSO is allowed to charge a feed-in tariff. This right is not used to a large extent today, but this might change with increasing distributed production.

5. Energy community and energy market

Chapter 5 focuses on energy market access opportunities for energy communities in the four countries analysed. In relation to the energy market, we can divide three areas:

(i) wholesale market access,

(ii) access to ancillary services markets and

(iii) direct peer-to-peer trading.

The wholesale access is possible via energy exchanges, see Figure 7 below (Energy Community 2022). EXAA in Austra, NordPool in Sweden, PXE in the Czech republic and Belpex, subsidiary of EPEXSPOT in Belgium. Direct participation in the wholesale market is rather expensive intended for larger entities due to non-negligible economic[4] and administrative costs. Another way of participation, especially for smaller entities, is to work with intermediaries.

Figure 7 - Overview of Power Exchanges in Europe

On ancillary markets, general trends in all countries are (i) unification of standard ancillary market products (renaming, reduction of required minimums), (ii) Involvement of energy storage facilities and flexibility aggregators in the market to ensure power balance, (iii) Linking of ancillary markets with neighboring ENTSO-E members and (iv) increasing volume and liquidity of day-ahead market. All these trends are contributing to a more open market for ancillary services and the possibility for smaller actors to get involved and be able to provide support services.

[4] e.g. prices for PXE Power Futures (Week/Month/Quarter/Year (Czech republic) is 0.015 EUR per MWh, PXE Czech Day and Weekend Futures are 0.03 EUR per MWh. Apart from that it is needed to pay an annual membership fee 19,000 EUR (EEX, 2022).

The concept of peer-to-peer trading is not yet fully deployed throughout Europe. However, there are a number of pilot projects in the many Member States with promising applications for energy communities, including Austria and Sweden. E.g. Horizon 2020 CoordiNet pilot in Sweden is developing peer-to-peer trading supported by Blockchain technology in order to facilitate customer engagement and reduce transaction costs (ENTSO-E, 2022). In Austria, a peer-to-peer trading platform is being tested in Vienna (Viertel Zwei location) in cooperation with Wien Energie and Riddle&Code company (BMK, 2021).

5.1. Participation in the wholesale market

5.1.1. Austria

On the Austrian energy exchange for electricity (EXAA, Energy Exchange Austria), electricity is traded on a day-ahead basis for delivery in Austria or Germany. Until 2018, in the absence of congestion, the wholesale market for electricity was fully coupled with Germany and formed a single price zone. Since 2018, the single price zone was lifted, and Austrian wholesale prices are independently created from German wholesale prices. With EXAA two auctions are done: at 10:15 a.m. the EXAA day-ahead auction for Germany and Austria for blocks, single hours, and quarter hours plus location spreads; at 12:00 a.m. the European day-ahead market coupling with single hours, block products and, currently in planning, ElCom reported linked blocks, see also Figure 8 below. (EXAA 2020) The Clearing and Transaction fee for the second trading is 0,035 Euros per MWh.

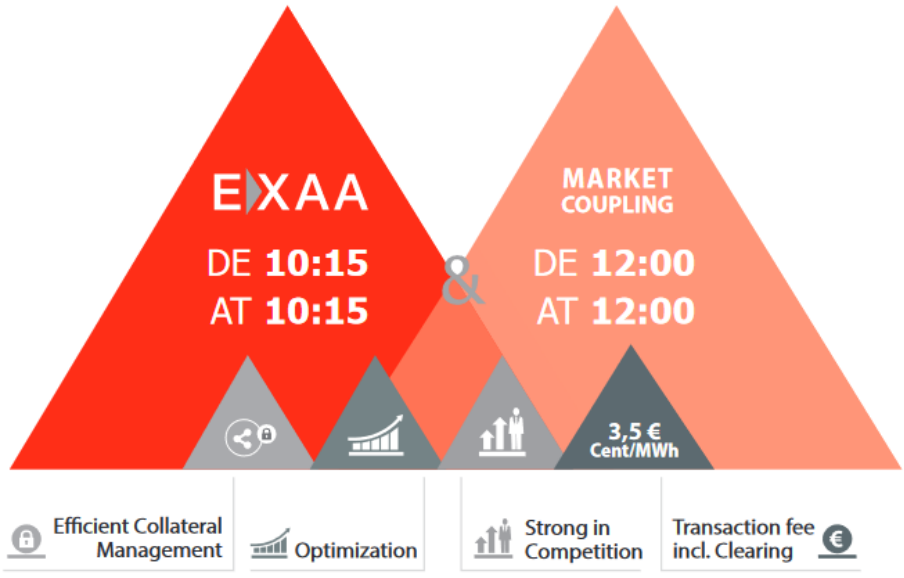

Figure 8: Overview of the auctioning sessions at EXAA in Austria

Green only orders are traded separately, so that green only products are possible. Excess green only electricity is forwarded to the standard grey auction. The transfer of Guarantees of Origin (GoO) can be carried out after their issue via national GoO-registers (E-Control in Austria, UBA HKNR in Germany) or cross-border vie the EECS Hub of AIB (EXAA 2020).

5.1.2. Belgium

Wholesale market is organized in Belgium by EPEXSPOT, with its daughter company Belpex, as well as Nordpool. The wholesale market is depending on the assets itself and is totally independent of the energy community.

5.1.3. Czech Republic

The Czech wholesale market for electricity is part of an integrated Central European electricity market through transmission links. Electricity is traded on the POWER EXCHANGE CENTRAL EUROPE (PXE), it is the Prague-based center of competence for the Central and Eastern European power markets. PXE provides trading participants with access to the day ahead market organized by OTE, a.s. in the Czech Republic and is also organizing derivatives market with power futures products. As part of EEX Group, PXE is developing products and services for the Czech, Slovak, Polish, Hungarian and Romanian market.

To trade on the PXE day ahead market the participants have to have an electricity trading license issued by the Energy Regulatory Authority in the Czech republic, be registered as an electricity clearing entity with valid access to the short-term electricity markets at OTE, a.s..

To participate in the derivatives market participants can access as direct participants. Participants have to have a contract with a clearing bank and a non-clearing membership in the European Commodity Clearing AG settlement centre and Become a trading participant on the EEX exchange and pay relevant costs associated with the memberships.

Those with insufficiently large trading volume that would justify the cost of direct participation can access indirectly via so-called Access providers (e.g. banks).

5.1.4. Sweden

The Swedish wholesale market for electricity is part of an integrated Nordic-Baltic market through transmission links.

Around 90 per cent of all electricity consumed in the Nordic region is traded on Nord Pool (and integrated in the EU-wide market link), while the remaining 10 per cent is traded by means of bilateral agreements. this means that the main direct participation in the wholesale market will be through Nordpool. The demands for participating in this market are:

- Be financially sound
- Have registered with a VAT register
- Hold a balancing agreement with the TSO

The alternative to direct participation on the Wholesale market is to set up I bilateral agreement with a trader that participates in the nordpool trade. This often requires that the electricity is bought from the same trader.

The current situation for micro producers, prosumers, has economic advantages in that installation up to 500 kW_p are not tax liable for produced electricity. Micro producers with more than 500 kW_p will pay a tax of 0,5 öre/kWh. When using the produced electricity.

There currently is a limitation on the production from prosumers. Each connection to the grid needs to be a net consumer over one year otherwise they will no longer be considered micro producers and loses advantages held by micro producers such as tax reductions, and the right to feed into the grid free of charge. This limitation is proposed to change to a limitation of a maximum input power of 43,5 kW. And no other limitations on amounts of supplied energy.

How the tax regulations will be in the coming EC legislation is still uncertain but there are indications that the sharing of electricity within an EC will be object to full energy taxation as well as VAT.

5.2. Participation in the ancillary market

5.2.1. Austria

Austrian electricity market is organized in balance groups. Each balance group is committing itself to keep production and consumption in balance. In case this cannot be done, either due to reduced production e.g., less wind, problem in power plants or to different consumption then expected, the imbalances must be settled by the control area manager (CAM) through adding or disconnecting of special back-up power plants ("minute reserve"). The costs of these balancing measures are charged to the balance group that was responsible for the respective fluctuation. A clearing and settlement agent (CSA), in Austria company APCS Power Clearing and Settlement AG, is calculating and charging these fluctuations monthly. In 2021, the cumulated monthly results of imbalance settlements aggregated to 72,09 Mio. EUR.

Since 2012 the TSO of Austria, company Austrian Power Grid AG (APG) is responsible for the procurement and activation of appropriate reserves within its LFC area (=an area where imbalances are settled by one entity, the TSO). This is done by means of regular tenders. Each market participant who meets technical and contractual conditions, can participate. Currently, three reserves are handled separately (APG 2022):

1. Frequency Containment Reserve (FCR):

Frequency Containment Reserve is a solidary reserve in Continental Europa, organized as a TSO-TSO model within Germany, Belgium, Denmark, Netherlands, France, Switzerland and Slovakia. FCR is needed to automatically compensate an imbalance between generation and consumption within a few seconds through corresponding activation (control). FCR works like a common safety net and stabilises the frequency of Continental Europe within compatible limits. FCR power in the amount of +/-3000 MW is continuously available in the grid of Continental Europe. Each LFC Area contributes to this common reserve based on an agreed yearly distribution key. The volume of FCR that must be provided by the APG LFC area lies at approximately +/-70 MW. The costs for keeping FCR available continuously a born by all generators above 5 MW.

2. Automatic Frequency Restoration Reserve (aFRR)

The automatic Frequency Restoration Reserve is an individual automatically activated reserve, which must be hold ready by each TSO for its LFC area. In case of an imbalance aFRR follows the activation of the common FCR, but is only activated in the LFC area where the imbalance originates. As a result, FCR is relieved and is again available to compensate further imbalances in Continental Europe. Whereas FCR must be activated within seconds, activation of aFRR must be completed after 5 minutes (full activation time requirement in the LFC area APG). The required volume of aFRR depends on the maximum load of the LFC area and the maximum expectable imbalance in the LFC area which is usually the biggest generator. When aFRR is too little to compensate the outage of the biggest generator in the LFC area additional manual FRR (see below) must be provided. This is the case in the LFC area APG. Austrian setting for aFRR is currently at +200/-200 MW.

3. Manual Frequency Restoration Reserve (MFRR)

Manual Frequency Restoration Reserve is on one hand needed to avoid longer lasting activation of aFRR (several consecutive quarters of an hour), because aFRR would be blocked for other additional imbalances. On the other hand, it is essential for the LFC area APG to compensate larger imbalances – e.g., outages of large generators, since aFRR is too little to cover such imbalances. The combined aFRR + mFRR must be able to compensate expectable imbalances within 15 minutes. Austrian setting for mFRR is currently at +280/-195 MW.

In line with the new European Guidelines on Electricity Balancing (European Commision 2017), Austria is member of initiatives to establish a European mFRR platform and a European aFRR platform. In respect to this, APG is operational member of the International Grid Control Cooperation (IGCC – the future imbalance netting platform for Region CE). APG also participates in the Manually Activated Reserves Initiative (MARI), which is the European implementation project for establishing the European mFRR platform. Regarding aFRR, APG takes part in the Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO), which represents the implementation project establishing the European aFRR platform. (APG 2022 2). Implementation of both European Reserves markets (PICASSO and MARI) is planned within 2022 (APG 2022 3) and will

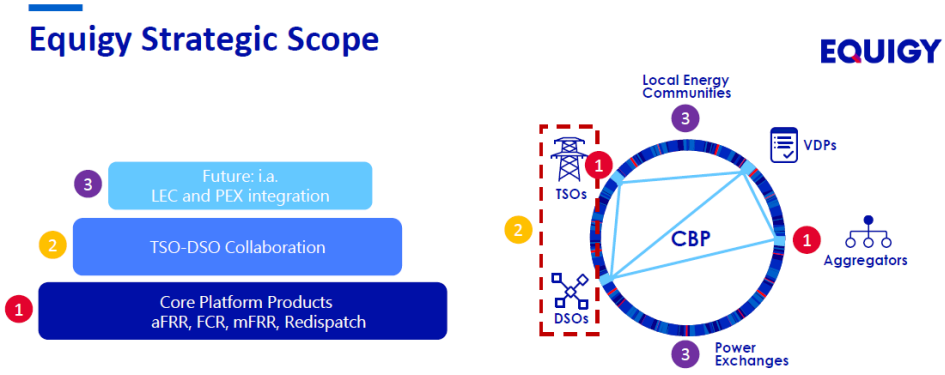

Figure 9 - Operational Scheme of crowd balancing platform EQUIGY

change the current way of calculating and tendering the services, as well as enabling easier access for smaller energy market actors to participate within the ancillary market.

The implementation is planned with participation in the EQUIGY market platform, a crowd balancing platform, which is now tested with various products in Netherlands, Germany, Austria, Switzerland, and Italy, see Figure 9 (Equigy, 2022).

5.2.2. Belgium

The Belgian ancillary market is operated by the TSO, Ellia. There is one federal regulator (CGRE—Commission for Electricity and Gas Regulation) and three regional regulators (CWaPE—Walloon Commission for Energy in Wallonia, VREG—Flemish Regulator of the Electricity and Gas Market in Flanders and BrUGEL—Brussels Gas Electricity in Bruxelles Region). To further foster demand-side participation in markets, a new market model, hereafter “transfer of energy—ToE”, was adopted in 2017 with the aim to allow the final customer to sidestep its energy supplier and value its flexibility by himself or by an intermediary that will be of his selection (Forouli et al. 2021).

The current market functioning rules for the compensation of quarter-hour imbalances, referred to as “Balancing Rules”, entered into force in February 2020. Pursuant to the Federal Grid Code, on July 2020 a new design for the FCR and automatic FRR (aFRR) services should be implemented (Elia, 2020). Under the new scheme the minimum bid size for participation in the Belgium balancing services is 1 MW. For the next period specific product design adaptations and alternative metering requirement are expected to further include capacity connected on low voltage/residential levels. In addition, focus will be given to projects (e.g., EU balancing projects) to further harmonize and integrate frequency-related ancillary services in a regional level (Forouli et al. 2021).

5.2.3. Czech Republic

The ancillary market in the Czech Republic is operated by the TSO, ČEPS, a.s. The ancillary market transformation is underway, and it is motivated by EU Regulation 2019/943 (Article 6-8). The main features of the transformation process are (i) unification of standard ancillary market products (renaming, reduction of required minimums), (ii) Involvement of energy storage facilities and flexibility aggregators in the market to ensure power balance, (iii) Linking of ancillary markets with neighboring ENTSO-E members (iv) further reduction of.

There are frequency and non-frequency services that are being acquired by TSO.

1. Power balance services - "frequency services"

The Power balance services include FCR - Automatic Frequency Control Reserves, aFRR - Automatic Frequency Restoration Process, mFRR - Manual frequency restoration process and RR - Replacement Reserves.

2. Other support services - "non-frequency services"

The other support services include secondary voltage and reactive power control, Island operation capability, and Start capability.

The minimum installed capacity for power sources to offer ancillary services is 1 MW. Also aggregated block of producers and consumers with aggregated capacity of 1 MW built up of smaller sources than 1 MW is allowed since 2021 if the aggregated block meets the certification process (on the parameters of quality and stability of the delivered service and response time). Table 4 describes the current characteristics of Balancing services in the Czech Republic (according to CEPS, 2022 and CEPS, 2022b).

Table 4: Types of Balancing services (Czech Republic)

Service type	Product name	Min. bid size (MW)	Max. bid size (MW)	Activation time (min)
FCR – Automatic Frequency Control Reserve	FCR	1	10	-
aFRR – Automatic Frequency Restoration Process	aFRR+ aFRR-	1	99	7,5
mFRR – Manual frequency restoration process	$mFRR_{12,5}$+ $mFRR_{12,5}$-	1	99	12,5
	$mFRR_{5}$+	1	Individual	5
RR – Replacement Reserves	RR- RR+	1	99	30

5.2.4. Sweden

The ancillary market in Sweden is operated by the TSO, Svenska kraftnät. They state that "ancillary services can be provided from power plants, assets with flexible electricity consumption, or energy storage."

The ancillary services procured by Svenska kraftnät are (Svenska kraftnät, 2021)

- FCR-N, Automatic reserve that stabilizes the frequency in the event of minor changes in consumption or production Automatically if the frequency changes within the range 49.90 – 50.10 Hz
- FCR-D, Automatic reserve that stabilizes the frequency in the event of operational disturbances Automatically if the frequency drops below 49.90 Hz
- aFRR, Automatic reserve that restores the frequency to 50 Hz Automatically through a control signal if the frequency deviates from 50.00 Hz
- mFRR, Manual reserve that relieves the automatic reserves and restores the frequency to 50 Hz Manually at the request of Svenska kraftnät if the frequency deviates from 50.00 Hz

To gain permission to participate in the respective markets, the provider of FCR and FRR must be able to demonstrate that the technical requirements on the reserve are met, by completing a prequalification with approved results. The requirements are summarized in Figure 10 below (according to SVENSKA KRAFTNAT, 2022)

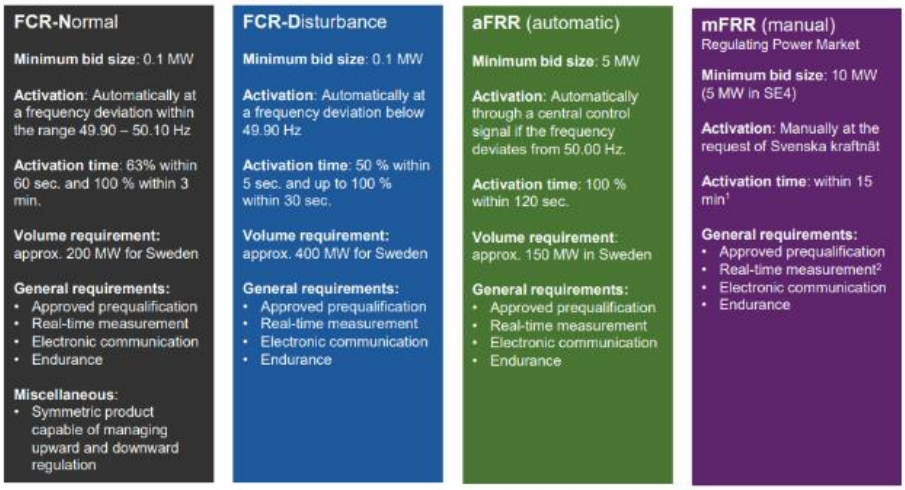

Figure 10: Overview of the Requirements on Reserves (Sweden)

The ancillary market is generally not accessible for ordinary consumers, micro producers, or consumers, due to the requirements listed above. A larger energy storage or the aggregated resources of an EC however can be able to meet these requirements. The minimum bid size for these services varies between 0,1 MW for FCR to 10 MW for mFRR as seen in the figure above.

Today, there are no products in the category of non-frequency-related support services in Sweden. During operation, the voltage and reactive power balance are maintained in the transmission system by means of remedial actions provided by fully integrated network components and by connecting parties.

6. Main barriers and incentives for establishing energy communities

In the following chapter we list some drivers and barriers for market adoption of Energy Communities, which are valid to the same extent all over Europe. This is followed by a list of national supporting measures for Energy Communities of the partner countries of the INTERACT project.

6.1. Drivers for Market Adoption

With the relatively new concept of Energy Communities, and their role in facilitating energy transition to a more sustainable and green power system, several initiatives are supporting the quick and wide-spread market adoption of the new concept, e.g., the European Commission with its Horizon Europe funding programme[5]. In its recent analyses, Soeiro and Ferreira Dias came to the following list of drivers for ECs and were sorting them based on the relevance from feedback of their online study, see Figure 11 (Soeiro and Ferreira Dias, 2020).

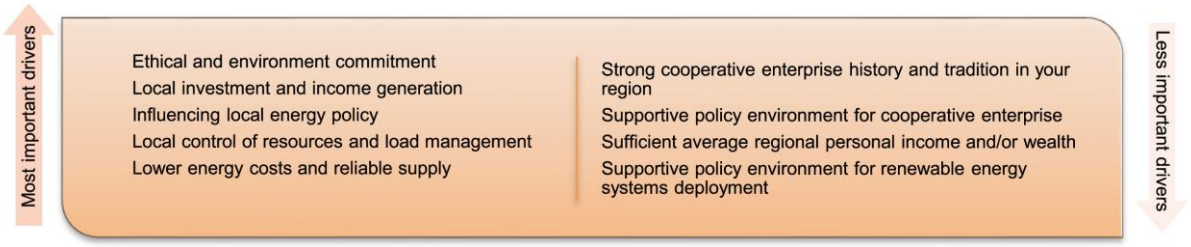

Figure 11 - Drivers of energy communities by relevance

6.1.1. Ethical and environment commitment

The biggest driver for energy communities is of course the increasing ethical and environment commitment, giving the transition to clean energy additional momentum. Recent events as the Russian invasion in Ukraine are emphasizing the importance and significance of energy independence and local energy production even more. This commitment is visible all over the world and will change our economy and the way we live in various ways. See as one example of many the United Nations Net Zero 2050 Coalition, with lots of professional information material online at https://www.un.org/en/climatechange/net-zero-coalition.

6.1.2. Unified legal framework within the European Electricity Market

One of the main drivers of the concept of energy communities is for sure the unified legal framework with Europe, largely driven by the European Commission. The directives described in Chapter 2 above are showing the importance of the matter and induce the necessary legal changes within the EU member states. Only with a valid legal framework in place, the concept of energy communities can leave the area of research and prototyping, and roll-out in large scale.

[5] For example Topic ID HORIZON-CL5-2022-D3-01-08 Supporting the action of consumers in the energy market and guide them to act as prosumers, communities and other active forms of active participation in the energy activities, with a total of 18 Mio. Euros

6.1.3. Smart Meters becoming compulsory in European Member States

Based on the European regulation 2009/72 EG by 2020 in total 80% of all households must be equipped with smart meters. This regulation led to related country-by-country regulation, ensuring that the overall goal will be met with all types of energy meters (mainly electricity and gas). Germany was passing the related "Gesetz zur Digitalisierung der Energiewende" (Act on Digitalization and Energy Transition) in 2016. In Austria the related laws are „Elektrizitätswirtschafts- und –organisationsgesetz" and „Gaswirtschaftsgesetz" (Act on Electricity and Act on Natural Gas), which require 80% by 2020 and 95% by 2022. Smart meters allow a better communication of consumption data, which is a base requirement for the establishment of energy communities. As an example, the Linky smart meter deployed throughout France is equipped with a radio transmitter that can be used to:

- adapt energy demand according to the offer,
- adapt the tariff at the right moment,
- control the demand when high-consumption devices are detected, and
- show the user's consumption via a tablet. (SmartmetersMag, 2016)

6.1.4. Unified legal framework regarding handling of personal data

Also, the handling of personal data within European Union is unified. This context allows a better cooperation between European companies, since their way of processing data will be the same. The GDPR rules don't prohibit any commercial activities dealing with personal data but asks companies to organize their way of processing with sensitive data to respect the rights of any citizen to its own privacy. This helps the establishment of European Markets based on the same set of rules.

6.1.5. Rising electricity prices

Finally, rising electricity prices are increasing the economic benefits of local production and local demand optimization and increasing the attention people are dedicating to energy in general. Figure 12 shows the average prices in Euros per MWh of several European countries as an example (Statista, 2022).

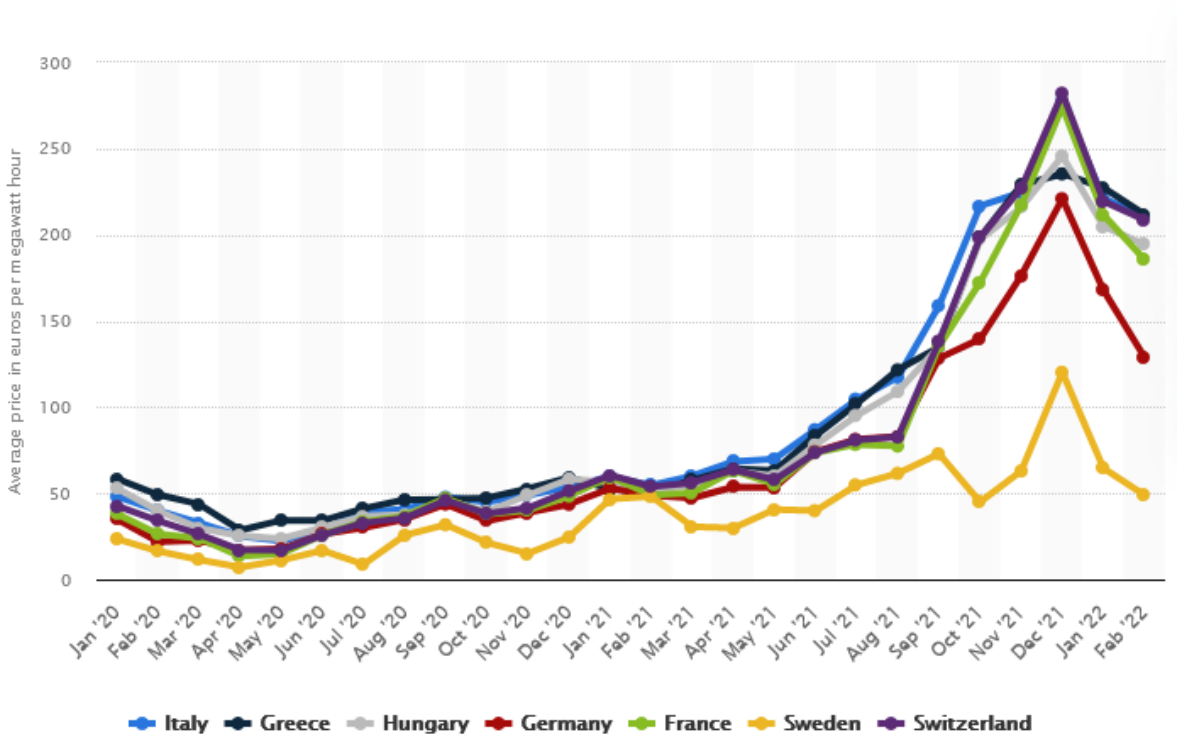

Figure 12 - Average monthly electricity wholesale prices in selected countries from 1/2020 to 2/2022

6.2. Barriers for Market Adoption

6.2.1. Pending national implementations of the European regulatory framework for energy communities

One of the main barriers of the concept of energy communities is for sure that the unified legal framework on the European level is not yet transferred to national laws, as described above in Chapter 3 – 5 by example of the four countries involved in INTERACT project. Furthermore, the application of the European Directives leaves lots of room for the individual countries to implement them in different ways. There can be proactive support with lots of rights for potential energy communities and their members, and easy access to energy markets, or very basic forms of their creation, with complex regulations and high administrative and bureaucratic barriers to start and operate ECs. The agenda of the country administration, together with the traditions in respect to green energy and citizen-based initiatives plays a role in its implementation. Of course, without a proper legal framework as a base, only few ECs will come to live and prosper in the respective country.

6.2.2. Limited room for money savings

Every electricity bill is composed of consumption tariff and taxes. Energy communities have an impact on the consumption and production of the members but can only impact the taxes indirectly. Some taxes are calculated according to the consumption, whereas some taxes are completely independent of the consumption. EC members therefore may reduce their total consumption, but the difference of economic savings might not reflect their efforts. On the other hand, as described above in 6.1, money is not the only motivational factor for the

adoption of energy communities. Furthermore, on the community level the sum of savings will add up to larger amounts of money.

6.2.3. Low valorization and understanding of energy

Potential Energy Community initiators must find their members. Energy is a sensitive topic which demands a lot of understanding: as it is not something material, it is difficult to make understand that the control of the consumption also depends on the consumer. When it comes to make energy savings, it is also necessary to understand how is organized the electricity market, and how oneself can adapt its contract to its habit, for ToU (Time-of-Use) tariffs by example. Also, many devices are primarily needed in the everyday life, and some high-energy devices like fridges can't be turned on/off. Changing energy habits is often perceived as a loss of comfort. Giving up, in part, a degree the autonomy over energy assets in the house, and thus making flexibility services possible, might be a barrier for large scale adoption.

6.2.4. Different pricing scheme and Taxation on Electricity in different EU member countries

Even though the energy market has been opened to competitiveness inside EU market (see Chapter 2), the pricing rules still depend on national rules and on which energy supplier is chosen by the end user. Prices can be on a fixed rate basis or can be ToU tariff, in which the price of the kWh consumed depends on the moment of the day. We can distinguish different types of ToU tariffs (Irena 2019):

- Static ToU: divided into time blocks (the most common is day and night tariff), the tariff is determined in advance and remains constant. You can also add a seasonality parameter, which offers a different tariff according to the winter/summer period.
- Real-time pricing: the tariff is adapted to the real-time consumption during the day. This pricing is dynamic and is calculated on a basis going from a high granularity (15 minutes) to a low granularity (1 hour). On his electricity contract, the consumer agrees on a wholesale price, plus a margin.
- Variable peak pricing: this tariff mixes static and dynamic pricing, where the different block times of pricing are defined in advance, but the pricing for the on-peak time depends on the market conditions.
- Critical peak pricing: in a few days during the year, the rate of electricity prices increases.

This pricing distribution is contracted between the consumer and the electricity supplier and may be fixed according to national grid rules. Regarding the possibility to shift the loads of energy demand, the market lacks harmony to have an impact. The taxes applied to the electricity prices also depend on national laws, and their rate on the bill isn't at the same level from one country to another.

The different pricing schemes might not be a direct barrier for local energy communities, as they are currently not foreseen to span above country borders. Nevertheless, they make international promotion and best-practice transfer of positive examples more difficult.

6.3. Incentives

6.3.1. Austria

In Austria several initiatives are supporting the establishment of first energy communities. Furthermore, the grid fees are reduced (as described in chapter 4.2.1). Furthermore, RECs don´t have to pay the Austrian volume-based fee to support renewables (Erneuerbaren-Förderbeitrag), and for electricity coming from DER from within the EC and consumed within the EC, no electricity tax is due. Information is available at the Austrian coordination point for ECs[6].

Additional financial support programs are in place for installation of different forms of renewables, e.g., PV installations, wind turbines, small-scall hydro power plants, etc. Such programs are available on municipality level, state level as well as national level.

6.3.2. Belgium

There is no specific funding program for EC's. There are pilot projects and regulatory sandboxes that test the new set-up. Depending on the progress of the implementation of the legislation framework in the different regions of Belgium, this might change though.

6.3.3. Czech Republic

The Czech Republic will provide investment support for energy communities from its so-called Modernization Fund. Currently, 1.5% (approximately 2.1 billion CZK - 81 million Euro) is earmarked for supporting the set-up of community energy (State Environmental Fund ČR, 2020). However, also the two largest programs of the Modernization Fund related to heat and renewables sources are open for community energy projects. The Modernization Fund is a new European instrument financed from the sale of emission allowances, which aims to help the Czech Republic and nine other EU Member States finance the transition to less emission-intensive energy sources. Depending on the price of emission allowances, the fund will have approximately CZK 150 to 200 billion between 2021 and 2030, divided into nine programs with different levels of allocation (State Environmental Fund, 2020).

There are other funding programmes[7] (funded by national and European sources) that support the installation of renewable energy sources - in particular rooftop photovoltaics (with or without on-site energy storage) for households, municipalities, and businesses.

6.3.4. Sweden

At the moment, there are no specific funding programs or other economic or structural incentives for ECs in Sweden.

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[6] www.energiegemeinschaften.gv.at

[7] such as https://novazelenausporam.cz/ (for households), https://www.opzp.cz/opzp-2021-2027/ (esp. for municipal sector), https://www.mpo.cz/cz/podnikani/dotace-a-podpora-podnikani/optak-2021-2027/ (for business sector)

7. Conclusion

The aim of this deliverable was to describe the current regulatory framework associated with the development of Energy Communities. We focused on Austria, Belgium, the Czech Republic, and Sweden.

The European regulatory framework set the basic guidelines for the establishment and operation of energy communities already in 2018 (REDII Directive, which introduced the concept of RECs, and in 2019 EMD Directive, which anchored the rules for CECs). Member States were obliged to implement these concepts and associated rules for operation by mid-2021.

Among four selected countries only Austria has already fully implemented the required European framework. In Austria, it is possible to observe a proactive approach not only in the implementation of the above-mentioned directives alone, but also in setting up an overall system of support (economic and administrative) for the establishment and functioning of energy communities. There are also special distribution tariffs for energy communities that are enabling distribution fees savings in range 20-60% (depending on the type of energy community and the topology of the grid). Austrian Energy Regulator must perform a cost-benefit analysis of the proposed regulations regarding energy communities by the end of 2023. The focus shall be the evaluation on the costs of the energy system including costs of balancing energy.

An example of an administrative incentive is the establishment of a dedicated coordination point in Austria to raise awareness of energy communities and provide practical assistance in setting them up.

In Belgium, the final legislation should be approved this year. The area of energy regulation is dealt with at a regional level (with separate Walloon, Flemish and Brussels energy regulators) which makes national comparisons more difficult. Especially in Wallonia region there are several pilot energy community projects that are helping to evaluate the possible market conditions.

In Sweden the legislation proposing transposition of RED II and EMD has been drafted in several different documents, the latest draft is from Spring 2022. In this final legal draft, the legislator states that there are no current barriers for forming energy communities. In the comments to the legislation, it is mentioned that this might change in the future if specific legislative issues arise that hinders energy communities to contribute to increased consumer power, sustainability, or efficient use of energy. But legislative changes will in this case concern the operations of an energy community not the organizational form or structure.

The Czech Republic has also not implemented the legislative changes concerning the implementation of RECs and CECs. The CSC concept is not enabled either.

Austria and Sweden are the countries where the INTERACT pilot sites are located. In the pilot site Großschönau, the village is already taking real steps to establish an energy community. Thus, during the continuations of the INTERACT project, we will have the opportunity to see a real example of the process of establishing an energy community.

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