

## Article

# Are We on the Right Track? Collective Self-Consumption and Energy Communities in the European Union

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**Abstract:** To accelerate the energy transition, the EU “Clean Energy for all Europeans” package aims to strengthen the involvement of end consumers in the energy market. To this end, together with so-called “active consumers” and provisions for individual and collective renewable energy self-consumption, two types of energy communities were introduced. The EU framework, however, leaves many details of the transposition process to the national level. The corresponding directives were supposed to be transposed by the end of December 2020 (recast Electricity Market Directive, defining active consumers and citizen energy communities) and by the end of June 2021 (Renewable Energy Directive, defining renewables self-consumption and renewable energy communities). In this paper, we critically discuss major developments of the transposition, including questions of the general distinction of the different concepts, governance and ownership, physical expansion, administrative barriers and the overall integration of energy communities into the energy system. The analysis builds on country case studies as well as on previous work by the authors on the status of the transposition process throughout the EU. The paper shows that the national approaches differ greatly and are at very different stages. While basic provisions are in place in most Member States to meet the fundamental EU requirements, the overall integration into the energy system and market is only partly addressed. This concerns, for instance, the analysis of system impacts of energy communities and measures that would allow and support energy system-friendly behaviour. In addition, several practical hurdles need to be overcome. These often relate to administrative requirements such as complex registration and licensing procedures, the need for the involvement of several institutions, or difficult procedures for access to relevant data. The paper concludes that discussed barriers will need to be carefully addressed if the high expectations for the role of energy communities are to be met.

**Keywords:** energy communities; clean energy package; collective self-consumption; transposition; renewables

## 1. Introduction

As part of the European Green Deal, the EU has raised its emission reduction ambition for 2030 from 40% to 55% based on 1990 levels, representing a step toward climate neutrality

by 2050 [1]. In addition, the goal for the share of renewable energy in the energy mix in 2030 was proposed to be increased from 32% to 40%. In this context, the “Fit for 55” package includes a range of legislative proposals to accommodate the new targets [1]. Among others, regulations and directives of the 2019 “Clean Energy for all Europeans” package (Clean Energy Package or CEP in the following) are adapted accordingly. At the same time, the energy transition requires major investments and the Clean Energy Package highlights the need to increase public acceptance for the involvement of citizens and to reduce energy poverty.

Against this background one of the aims of the Clean Energy Package is to strengthen the involvement of new actors, in particular end-consumers, to foster their acceptance of renewable energy, and to mobilise private capital. This comes along with specific frameworks that are to enable new business models for decentralised energy systems. To this end, together with so-called “active consumers” and provisions on individual and collective renewable energy self-consumption, two types of “energy communities” were introduced. While different forms of collective self-consumption (CSC) of renewable energy have been in place previously and the term “energy community” has been used for a range of collective, energy-related initiatives [2], the CEP established a first EU-wide regulatory framework for such initiatives. Energy communities, according to the CEP, provide for organisational frameworks for collective energy initiatives, which have new possibilities to act in the energy sector, including new rights to access the energy markets. The EU framework, however, leaves many details of the transposition process to the national level. This includes governance and membership-related questions such as control and autonomy, the physical expansion of renewable energy communities (RECs), or questions regarding ownership. Not least, there is no further guidance for the overarching question of how to integrate energy communities in the energy system and market, which will be of high importance for their success. The corresponding directives were supposed to be transposed by the end of December 2020 for the recast of the Electricity Market Directive (EMD) [3], defining “active consumers” and citizen energy communities (CECs) and by the end of June 2021 for the Renewable Energy Directive (RED) [2], defining renewables self-consumption and renewable energy communities (RECs). However, even though these deadlines have already passed, the transposition is in progress in most Member States.

At the time of writing, Austria, Ireland, Belgium, Italy, Lithuania, Poland, Luxemburg, Slovenia, France, Finland and Portugal had adopted REC frameworks to different degrees of detail, while, Denmark, the Netherlands and Hungary had draft frameworks in place and Sweden at least a consultation document. Regarding CEC frameworks, Denmark, Belgium, Finland and France had basic frameworks in place, while Austria, Croatia, Italy, Romania, and Slovenia had draft legislations. In all other countries except Malta and Cyprus however legislative processes have started.

The aim of this paper is to assess, compare and discuss the approaches to national transposition of the EU provisions for energy communities and collective self-consumption. This includes the question to what extent the current national frameworks already enable the realisation of the aims of the CEP as mentioned above. Ultimately, the article will contribute to the current discussion on the transposition process that is far from finished, even after the official deadlines. The paper may also inform practitioners and policymakers about potential pitfalls and suitable approaches to framing collective self-consumption and energy communities according to the CEP.

## 2. Ambition and Method

High expectations are expressed at EU level on the future role of citizens in the energy transitions, while pre-existing community initiatives are acknowledged in, for example, the recitals of the EMD. The Commission Communication of 25 February 2015, entitled ‘A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy’ has already expressed the vision of an Energy Union “with citizens at its core, where citizens take ownership of the energy transition, benefit from new technologies

to reduce their bills, participate actively in the market, and where vulnerable consumers are protected". The frameworks for energy communities and self-consumption are a centrepiece of EU policies to support this vision. In addition, the CEP considers energy communities not only as a way to empowering citizens but also as a means to re-structure the energy systems toward decarbonisation and flexibility. EU Member States should therefore ensure that energy communities can participate 'on an equal footing' with large participants in the energy market. For RECs, Verde et al. [4] even state that the CEP is expected to represent a turning point, as for the first time both, their very existence and their potential role in the energy transition receive legal recognition at EU level. On these grounds, we investigate the hypothesis that energy communities and self-consumption as defined by the CEP can substantially contribute to the empowerment of citizens and the transformation of the energy system and market in the EU. We aim at answering several questions on the way to reaching these expectations:

- To which extent have the provisions of the CEP been translated into national frameworks so far?
- How do Member States specify their frameworks by filling the space for national interpretation?
- Which specific barriers and supportive factors result from national transposition for actual implementation?

Finally, we thereby want to contribute to the overarching question of whether EU Member States are on the right track to reach the above-stated visions and goals of energy communities and collective self-consumption schemes as defined by the CEP.

Since the transposition process of the CEP is ongoing, first analyses have been published comparing and assessing the different national approaches to transposing the concepts of collective-self consumption and energy communities. In many cases, however, details of national transpositions were still missing. One strand of literature compares design elements from a regulatory and legal perspective and assesses how the national transposition corresponds to the CEP. This includes analyses of single countries such as by Fina et al. [5] and Cejka et al. for Austria [6] or Zulianello et al. [7] and Candelise et al. [8] for Italy. A few publications provide a basic comparison of transposition approaches in a range of EU Member States. This includes Hannoset et al. [9], who, among others, categorised transposition approaches into concepts integrating RECs and CECs in different ways, and a 'box ticking' model in which a Member State just copy-pastes the provisions of the EMD and RED. Tuerk et al. finally [10] assess the limitations of national implementations to realize Plus Energy Districts as energy communities.

Another strand of literature focuses on questions of practical implementation and governance covering also pre-existing initiatives not yet falling under the CEP provisions. These analyses include the comparison of possible initiatives enabled by the CEP with pre-existing approaches, often focusing on (suitable) organisational and governance structures. Lowitzsch et al. [11], for example, assess design and governance structures of RECs and CECs and analyse to what extent they fulfil the aims of 'RES clusters', being characterised by complementarity of different energy sources, flexibility, interconnectivity of different actors and bi-directionality of energy flows. Horstink et al. [12] provide an overview of the diversity of collective renewable energy prosumer initiatives in Europe as well as a stock-taking of the demographic, technological, organisational, financial, motivational, hindering as well as facilitating factors that characterise them. The authors assess how these approaches align with current energy policies and incentives and the extent to which they would fit into the provisions of the CEP that, according to their analysis, could also be limiting. Cobut [13] considers both, the CEP and what it reveals about the renewable energy governance of the EU itself, exploring the place given to RECs and their struggle with energy incumbents. Furthermore, a few recent papers such as by Palm [14] and results from the COMETS project [15] assess barriers to implementing energy communities in EU countries, however not limited to the narrow definitions of the CEP. A set of recent publications investigates possible business models for CSC, RECs

and CECs, that importantly depend on the national regulatory and policy frameworks as acknowledged by Botelho et al. [16].

The novelty of this paper is its strong empirical basis in systematically assessing the diverse transposition approaches for specific elements of the CEP that have been mapped in detail by the authors. The paper focuses on case studies in six EU Member States complemented by insights from previous stock-takings in all EU 27 countries to provide a systematic overview. Also, the authors contributed to interviews made with regulators and research partners in many EU Member States in 2020 and 2021 as part of the EU BRIDGE Energy Communities Task Force [2]. This helped to crosscheck assumptions, broaden insights, and validate findings. For the selected Member States, in addition to the analysis of the regulatory approaches, observed and potential practical implications of design choices are discussed and the fit with national legislation has been investigated. Given the qualitative nature of the analysis, the paper aims at detecting broader patterns rather than providing quantitative assessments and conclusions.

The case studies cover Austria, Croatia, Greece, Portugal, Slovenia, and Spain. These countries were selected due to the direct involvement of the authors with national stakeholders and public authorities, the ease of access to national policy and stakeholder documents as well as the involvement in practical implementation. The exchange with relevant stakeholders and public institutions thereby contributed to a better understanding of the regulatory landscape and its potential impacts. For all case study countries, an analysis of the relevant policy documents was undertaken. Except for Austria, the case studies involve experiences from the implementation of energy community demonstration projects of the H2020 project COMPILE [17]. Detailed insights into existing barriers could thereby be included. The analysis of this paper thus consists of two major analytical strands:

- (1) A comparative analysis on the transposition progress and national regulations of the relevant provisions of the CEP in a large range of EU countries
- (2) A discussion of qualitative insights on barriers and supportive factors from actual implementation as well as the related political debate in the case study countries

The discussion of the transposition process covers (1) the general definitions and scope of RECs, CECs, and CSC and the resulting distinction or overlaps between the three concepts, and (2) the national specification of major elements of the CEP provisions on these new types of initiatives. These specific elements of transposition have different characteristics. They cover the general framing in terms of enabled activities and system boundaries, a range of governance aspects and questions of technical implementation, as well as support. In addition, we specifically address the overarching goal of the CEP to address vulnerable consumers and to reduce (energy) poverty. Table 1 provides an overview of the analysed features of the national frameworks.

**Table 1.** Elements of national transposition analysed in this paper.

|                                       |  |
|---------------------------------------|--|
| General framing of energy communities | General definition and differentiation between CSC, RECs and CECs<br>System boundaries<br>Enabled activities |
| Support mechanisms                    | • Local tariffs  |
| Technical implementation              | • Distribution of energy to participants   |
| Governance                            | • Legal form<br>• Effective control/proximity<br>• Autonomy<br>• Ownership                                   |
| Overall targets of the CEP            | • Addressing vulnerable groups   |

The work is presented in three main chapters as well as separate discussion and conclusions sections. First, the relevant EU directives are presented in Section 1. Section 2

describes the general definitions and barriers for RECs, CECs, and CSC in the case study countries. In Section 3, a more detailed analysis of the above-stated provisions is provided, based on case studies but including broader insights from additional EU countries. Section 4 provides for a discussion including findings from related projects. Finally conclusions are presented in Section 5.

### 3. Definitions and Concepts of the EU Framework

To frame the arguments presented by the paper, we introduce the broader European framework for citizen involvement and collective initiatives in the energy sector as well as the specific concepts and definitions for (collective) self-consumption and energy communities.

The recitals 42, 43 and 44 of the recast EMD, as well as the recital 67 and 70 of the REDII, deliver a clear message. A prime goal of the two directives is to expand the role of consumers in the energy market, highlighting:

- An increased acceptance of renewable energy;
- The mobilization of additional private capital;
- An increased energy efficiency at household level;
- The reduction of energy poverty through reduced consumption and lower supply tariffs; as well as
- The inclusion of vulnerable consumers and tenants.

To this end, both the recast EMD as well as the REDII include different types of “prosumer” concepts, covering both individual and collective activities in the energy sector [18]. While the EMD introduces the ‘active customer’ (Art 2(8)), the REDII defines ‘renewables self-consumers’ (Article 2(14,15)):

‘Active customer’: ‘a final customer, or a group of jointly acting final customers, who consume or store electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity’

‘Renewables self-consumer’: ‘a final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity’

‘Jointly acting renewables self-consumers’: ‘a group of at least two jointly acting renewables self-consumers [ . . . ] who are located in the same building or multi-apartment block.

In this paper, we use the commonly adopted term “collective self-consumption” (CSC) for initiatives of joint generation and consumption, which may have characteristics of all concepts described above, depending on the national frameworks. Generally, national CSC schemes, however, refer to renewable energy and do not address the broader scope of active customers (flexibility, energy efficiency). Therefore, the discussed concepts in this paper and the following explanations primarily refer to the CSC concept as defined in the REDII.

While these concepts primarily define specific activities to which consumers shall be entitled, energy communities first of all provide for an organisational framework for collective initiatives. The two types of energy communities, namely Citizen Energy Community (CECs) and Renewable Energy Communities (RECs), are defined in Art 2(11) of the recast EMD and Art 2(16) of the REDII respectively. They are specified in articles specific to these concepts (Art 16 EMD, Art 22 REDII). Despite several important differences, they have major commonalities. They:

- Require a legal entity as a community umbrella;
- Must be voluntary and open;
- Should be primarily value-driven rather than focusing on financial profits;
- Require specific governance (i.e., “effective control” by certain participants).

Table 2 shows the more detailed definitions including indications on potential activities and governance criteria (membership and effective control). Details on the definitions and requirements shown in the table, such as the proximity requirement of effective control for RECs, are subject to the discussion in the following sections.

**Table 2.** Comparison of the “renewable energy community” and “citizen energy community” concepts according to the REDII and the recast of the EMD [19].

| Article 2(16) Recast Renewable Energy Directive<br>“Renewable Energy Community”  | Article 2(11) Recast Electricity Market Directive<br>“Citizen Energy Community”  |
|--|--|
| A legal entity:  | A legal entity that:   |
| (1) Which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity; | is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;   |
| (2) The shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;   | has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and  |
| (3) The primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.   | may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders. |
| The REDII further states that RECs shall be entitled to produce, consume, store and sell renewable energy, including through renewables power purchase agreements.   |  |

Through previous work of the COMPILE project, the authors have produced a checklist on potential activities and governance aspects to better understand the relationship between the two definitions of energy communities and CSC (jointly acting self-consumers) (Table 3).

**Table 3.** Activities and actors foreseen for CSC and energy communities (based on [19]).

| Activities   | REDII |     | EMD |
|--|-------|-----|-----|
|  | CSC   | REC | CEC |
| Production (REDII: renewables)/Generation (EMD: electricity) | ✓     | ✓   | ✓   |
| Consumption  | ✓     | ✓   | ✓   |
| Storage  | ✓     | ✓   | ✓   |
| Sale (CSC: excess electricity), e.g. via:                    | ✓     | ✓   | (✓) |
| - Renewables PPAs  | ✓     | ✓   | (✓) |
| - Electricity suppliers                                      | ✓     | ✓   | (✓) |
| - Peer-to-peer trading                                       | ✓     | (✓) | (✓) |

Table 3. Cont.

| Activities   | REDII |                | EMD            |
|--|-------|----------------|----------------|
|  | CSC   | REC            | CEC            |
| Sharing  | ✓     | ✓              | ✓              |
| Supply   |       | ✓ <sup>+</sup> | ✓              |
| Aggregation (RSC: “through aggregators”)   | (✓)   | ✓ <sup>+</sup> | ✓              |
| Energy Efficiency Services   |       |                | ✓              |
| EV charging services   |       |                | ✓              |
| Other energy services (RED: “commercial”)  |       | ✓ <sup>+</sup> | ✓              |
| Shareholders or members  |       |                |                |
| Natural persons  | n.a.  | ✓              | ✓              |
| Small and Medium Enterprises (SMEs)  | n.a.  | ✓              | ✓              |
| Large enterprises  | n.a.  | X              | ✓              |
| Local authorities incl. municipalities   | n.a.  | ✓              | ✓              |
| Effective control (RED: proximity requirement, EMD: membership in general is restricted, energy sector no primary area of economic activity) |       |                |                |
| Natural persons  | n.a.  | ✓              | ✓              |
| Micro enterprises  | n.a.  | ✓              | ✓              |
| Small enterprises  | n.a.  | ✓              | ✓              |
| Medium enterprises   | n.a.  | ✓              | X <sup>§</sup> |
| Large enterprises  | n.a.  | X              | X              |
| Local authorities incl. municipalities   | n.a.  | ✓              | ✓              |

<sup>+</sup> Reference to “the provisions relevant for such activities” (✓) Not explicitly stated but assumed to apply <sup>§</sup> However, the CEC as such can be organised as an SME (EMD, recital 44).

While discussing the delivery success of the expected goals and outcomes of energy community concepts, it is important to keep in mind the spirit of the legislation, such as to promote the empowerment of European citizens in the energy market. The recital 43 of the EMD traces back the role of CECs to “recognising certain categories of citizen energy initiatives”, referring to community energy initiatives. Thus, it is apparent that energy communities are concepts to be examined in the light of the European policy objective of a citizen-centric Energy Union [20], the goal of which being to drive the energy transition, but also to achieve ownership of this transition by citizens while protecting vulnerable consumers. It is, therefore, important that the transposition of provisions relating to CECs and RECs have these broader goals in mind.

The transformative role of energy communities is becoming ever clearer as the July proposal for revision of the Energy Efficiency Directive is also creating coherence with the EMD and REDII by acknowledging the role of energy communities to deliver efficiency targets and to tackle energy poverty.

#### 4. General Frameworks and Major Hurdles in the Case Study Countries

In this section, we introduce the general frameworks for CSC and energy communities in the COMPILE partner countries as well as in Austria. Further details are introduced in the later subsections where specific elements of the transposition process are discussed.

##### 4.1. Austria

Collective-self consumption had already been introduced in Austria in 2017, before the finalisation of the CEP, as part of an amendment of the electricity act (ElWOG) [21]. The act

supports CSC of natural persons and companies (in e.g., multi-apartment buildings), including electricity sharing between individual consumers which previously was hardly possible. So far, the use of the public grid for energy sharing has not been permitted. The amendment defined specific aspects of CSC such as the role of the different actors involved and the required contractual relationships between them. In particular, a central role is given to the distribution system operator (DSO), who is responsible for applying predefined rules for energy sharing.

In July 2021, a legislative package on the expansion of renewable energy was adopted [22]. The package establishes the Renewables Expansion Law (Erneuerbaren-Ausbau-Gesetz, EAG) and amends several existing energy-related laws, including the above-mentioned electricity act ElWOG. The new EAG establishes a general framework for RECs in relation to renewable expansion and its support, while the ElWOG includes a more detailed framework for both RECs and CECs. According to the law, by the end of 2023, the Federal Minister for Climate Protection, Environment, Energy, Mobility, Innovation and Technology has to carry out an evaluation of the EAG, also covering RECs, CECs, and CSC. The evaluation is to include an analysis of the status quo, obstacles and barriers, suggestions for improvement, and requirements for adaptation.

The government foresees the establishment of a one-stop shop for the support of energy communities [23], which is currently being developed and is supposed to operate on the level of each federal state. Major issues that may hamper the roll-out of energy communities and that are currently discussed include:

- Data access. So far, the distribution of shared energy is done by the DSO *ex post*, not allowing for real-time management based on smart meter data. Energy communities may be able to access real-time data in the future via an interface of the smart meters, but data reader devices have to be paid for by the energy communities and needed interfaces are currently still being defined.
- A full transposition of new energy market frameworks as foreseen by the recast EMD is still outstanding. Consequently, energy communities, at this first stage, primarily represent an expanded concept of CSC. In combination with the scheduled review of the laws, the options to make full use of the potential of the CEP can be expected over the years to come.

#### 4.2. Croatia

The transposition of both, the recast EMD and REDII is expected to be completed by the end of 2021, with additional bylaws to follow in 2022. Citizens' energy communities are to be defined in the forthcoming electricity market act, while RECs will be included in the new law on renewable energy sources and high-efficiency cogeneration [24]. This will provide an initial framework for CSC, CECs and RECs, but with several identified restrictions.

It is foreseen that CECs will be limited to operating behind a single low voltage (LV) transformer station and in the same municipality, effectively blurring the distinction with RECs. The draft of the RES law defines RECs rather generally and fully according to the EU definitions and requirements. It sets, however, a limit for the total connected power of all production facilities of 500 kW. For both, RECs and CECs, the production capacity is limited to 80% of the consumption capacity of the members.

At this moment, no incentives for CECs or RECs are foreseen, which could hinder the deployment of CECs and RECs, especially considering the very low electricity prices for households. Still, first CSC examples, namely on multi-apartment buildings, are expected to develop on a commercial basis. Major issues impeding a roll-out of energy communities in Croatia are:

- The spatial limitation for RECs and CECs.
- The limitation for cooperatives in Croatia to carry out leasing activities without a leasing licence.

- Additional legislative and administrative barriers for cooperatives. For example, members of cooperatives cannot be regarded as unemployed persons, thus excluding cooperative members from all related rights [25].

Overall, as in other new Member States, CSC schemes do not yet exist, and cooperatives have a negative connotation given the past political system.

#### 4.3. Greece

In 2014, a net metering system for autonomous producers was adopted [26]. Later, in 2016, “virtual net metering” was also introduced [27]. In this context, city councils, schools, universities, farmers and farming associations are allowed to develop photovoltaics (PV) and wind power projects of up to 500 kWp. The application of virtual net metering in the case of energy communities was implemented in 2018 with the law 4513/18 [28] and further detailed in the government gazette 759/2019 [29]. This allows for net metering of different metering points over a timeframe of three years and a production capacity of up to 100% of the consumption capacity of participating members.

The Greek energy community law is different from other transposition approaches in Europe in the sense that it preceded the final version of the relevant EU directives. Nevertheless, it addresses a major part of the EU framework providing novel interpretations on specific issues such as insularity and energy poverty. An energy community is to be organised as a cooperative that can produce, distribute, and supply renewable energy from installations of up to 3 MW. Additional activities may include natural gas heating/cooling, demand-side management, aggregation of producers/consumers, and network development.

The law distinguishes two types of energy communities: non-profit and for-profit cooperatives. In non-profit cooperatives, financial surpluses are not distributed to members but remain in the energy community in the form of reserves and are distributed for its purposes by the decision of the general assembly. The surplus of for-profit cooperatives is permitted to be distributed between members under certain conditions and after deduction of the regular reserve. Each type varies in composition and the minimum number of members as explained in the subsequent chapter.

Since the introduction of the Greek law on energy communities in 2018, several energy communities are emerging. According to a study by the Greek Centre for Renewable Energy Sources (CRES) [30], there have been 909 energy communities registered as of May 2021. Despite the early introduction of energy communities in the Greek legislation and their growing number, the development of such cooperative schemes faces a series of barriers and obstacles which reduce the social and financial impact of the concept. The major obstacles can be summarised as follows:

- The incentive that was available to energy communities, providing priority in connecting RES projects to the grid, led to an increase in “virtual”, non-citizen based energy communities, aiming to take advantage of the incentive and develop PV projects. This sparked discomfort among other RES investors which led to the ministry re-evaluating the incentive, considering cancelling it.
- There is a lack of financing tools and relevant information for energy communities. Also, access to bank loans is practically not available for small non-profit schemes, since they can offer no collateral.
- The legislation states that CSC via virtual net metering may be performed by community members only when they have the same electricity supplier.
- The legal framework on renewable energy is exceptionally fragmented, making access to information very complex; there is no unified and integrated legal framework.

#### 4.4. Portugal

The Portuguese legislator has started the transposition of the EU framework introducing RECs and CSC schemes in the Decree Law 162/2019 from October 2019 [31]. With this legislation, the Portuguese government renewed the previous regulatory framework on

individual self-consumption introducing the concepts of RECs and CSC. As RECs are defined as part of this CSC framework, their scope is currently limited to generation and self-consumption of electricity. There are currently no other pieces of legislation including RECs. CECs have not yet been introduced.

In Portugal, CSC activities can be performed by RECs and by a group of singular or collective entities organised and located in the same building or area, close to the shared renewable energy power plants. Both solutions require: (1) an internal regulation that needs to include at least basic management and sharing rules (for self-consumption and potential revenues); (2) an entity responsible for the operational management of the self-consumption activities and the communication with the respective operators; (3) a responsible technician.

Even if it has been possible to register CSC projects and RECs since the beginning of 2020, there are still no operational projects. This situation may be linked to several factors:

- There is a lack of transparency and the access to information usually requires a significantly lengthy process that involves several entities. For example, official national smart-meter roll-out plans are still not publicly available and receiving information as to whether the public grid is needed for a CSC scheme requires the involvement of two different entities (the DSO and the Directorate-General for Energy and Geology-*Direção Geral de Energia e Geologia*, DGEG).
- From a business perspective, the benefits of proceeding with a CSC initiative do not cover the additional risks and operational costs compared to a traditional (simple) self-consumption project.
- The current regulation imposes several bureaucratic procedures, such as the creation of an internal regulation system, without providing any template or central point of support to ease the creation of citizen-led initiatives.

#### 4.5. Slovenia

Slovenia has adopted a bylaw (Regulation on self-supply with electricity from RES) that entered into force on 1 May 2019 [32] and defined CSC and "RES communities". In addition to individual self-consumption that was already possible for owners of individual houses, it allows for two forms of CSC [19]:

- CSC in multi-apartment buildings, where the inhabitants can share energy from a RES-generation unit connected to the LV network of the building. All the consumption metering points (of the individual consumers and of the joint consumption) are connected to the LV network of the building. The RES production unit is located on the building and is connected through its own metering point to the point of common coupling of the building network with the LV distribution grid.
- CSC in 'RES communities' can be formed by customers in various types of dwellings. The RES production unit can be located at a separate building and is connected to a dedicated production metering point on the LV distribution grid. The consumers participating in the RES community can consume electricity through two or more consumption metering points that are connected to the metering point of the RES production unit by the LV distribution grid of the same transformer station. It is important that the RES production unit is not (and has never been) taking part in any RES support scheme. As opposed to the EU rules for RECs, no legal entity needs to be formed; only, a contract must be signed between the members of the CSC scheme, defining how the RES production is divided internally.

In 2021, a draft electricity supply law was presented defining active consumers and CECs. The law is foreseen to be adopted by end of 2021 at the latest and to come into force in April 2022 [33]. Major issues for the further roll-out of energy communities in Slovenia are [25]:

- The limitation of the current concept of RES communities to the area behind the LV transformer.

- For the DSO that is responsible for managing energy sharing there are no established standard procedures.
- Undefined responsibilities between microgrid operators and external DSOs.

#### 4.6. Spain

Several steps are being taken by the Spanish Government towards a more democratised energy sector. The most recent example is the Spanish Law 7/2021 [34] on Climate Change and Energy Transition that was approved on 20 May 2021. The law has a very wide scope, setting the basis for the overall energy transition of the country. However, there are other more specific actions addressing different steps in the whole energy value chain. Some examples are the latest preliminary draft law for the creation of a National Fund for the Sustainability of the Electric System [35], or the Royal Decree 23/2020 published on 23 June 2020 adopting measures in the field of energy and other areas for the economic recovery [36].

The aforementioned Decree served as the kick-start for the transposition of the EU energy community frameworks. In that document, the RECs were introduced into the national framework, however not yet providing for specific details. CECs are currently not yet defined in Spain. Thus, this decree sets out only the first step towards an actual mature and fully deployed framework for energy communities.

The definition of a framework on CSC, in contrast, is significantly advanced in Spain. According to the Spanish Royal Decree 244/2019, published on 5 April 2019 [37], groups of several consumers may collectively supply themselves in an agreed manner with electrical energy that comes from production facilities close to the consumption point and associated with them.

In the same way as for conventional self-consumption, the consumers participating in CSC can adhere to any of the current self-consumption schemes in force [37] (all consumers from one RES installation must adhere to the same scheme), which are:

- (i) Self-consumption without feeding the surplus electricity to the grid
- (ii) Self-consumption, feeding the surplus electricity to the grid
  - (a) With remunerated surplus electricity. In this case, the produced electricity must come from RES, with a rated power no higher than 100 kW and must not be subject to any special retributive scheme for RES
  - (b) Without remunerated surplus electricity

The most common scheme is the one listed under (ii.a) above, where consumers receive a price linked and very close to the pool price of the spot market. Additionally, to be able to belong to a CSC scheme, both production and consumption connection points must fulfil the following requirements:

- (1) Their low voltage distribution lines must be connected to the same secondary substation (LV to medium voltage, MV).
- (2) Both, production and consumption connection points must be within a geographical range of 500 m.
- (3) Their cadastral reference must be under the same sector (first 14 digits). This may lead to cases where two potential participants are in proximity but registered in two different sectors and hence are not able to perform CSC.

CSC schemes connected to the public grid must sign a document to inform the public administration of the percentages of property of the installation and the way in which the electricity is allocated to each connected consumer. With that information and a bidirectional smart meter attached to the generation plant, the DSO and retailers automatically clear the balances.

Thus, the current CSC scheme in Spain has an important similarity with RECs, in particular, due to possible use of the public grid under defined conditions. In contrast with RECs, CSC schemes however do not have to be organised as a legal entity.

A public consultation revealed important issues for a roll-out of energy communities in Spain, partly taking a broader, longer-term perspective as compared to questions of individual transposition elements. For instance,

- Spain would need to invest in technological development (e.g., blockchain-based tools for in-community electricity trading—like Pylon Community [38] or public planning tools—like Impact-E [39]).
- Spain would need demonstration sandboxes to materialise the deployment of a local, energy community-based ecosystem and a flexibility market, considering vulnerable groups and to have field-based experiences to keep developing relevant and impactful legislation [40].

## 5. Specific Elements of the Transposition Process

While the EU directives provide general frameworks for CSC and energy communities as presented above, details largely need to be defined at the national level. This includes the general definition and differentiation of the concepts and the potential physical expansion, as well as definitions of different terms and their interpretation such as the concepts of “autonomy” and the “proximity” to the renewable energy projects of REC members exercising effective control. Also, the concept of “ownership” of the involved installations may underlie different legal interpretations. Further questions of organisation and governance include potential definitions of the legal form an initiative may take. In addition, the definition of practical procedures, such as the distribution of the generated energy to the participants, are central for actual implementation. However, several Member States have dealt with the transposition process in a superficial way, copy-pasting the EU definitions without clarifying the key concepts. Finally, other connected obligations linked to the REC/CEC definitions are often absent from the transposition process, for instance, the introduction of an enabling framework, which will promote the development of energy communities at the national level for RECs (Art 22(4) of RED II).

In the following, we move from the general concepts to the more technical questions, governance-related aspects and potential activities. Finally, related to the overarching goals of the CEP, we discuss the question of how vulnerable groups are addressed.

### 5.1. Differentiation/Relationship between CSC, RECs and CECs

CSC, RECs, and CECs are defined separately in the CEP. Nevertheless, the fact that CSC represents an activity while energy communities focus on an organisational umbrella suggests overlaps where CSC can be carried out in the framework of an energy community. In addition, the national transposition approaches differ strongly regarding the differentiation between the concepts, including overlapping definitions or linking of the different approaches.

While the EU framework would already allow a CEC to carry out activities for a REC or to serve as an umbrella for several RECs, such concepts are partly specified in more detail at the national level. In Ireland for example, CECs are proposed to be clusters of RECs that can be dispersed throughout the entire country [41]. In Italy, virtually aggregated units have been defined in the past (called UVAM) that have certain characteristics of CECs as they can virtually exchange and pool electricity but underlie geographical limitations. RECs in Italy are linked to this virtual model with stricter spatial limitations [42].

In Croatia, as explained above, CECs are formally introduced but a limitation to the local area (municipality) is defined. Thus, the concept merges characteristics of both, CECs and RECs. In Portugal, for now, only RECs are defined as part of the self-consumption regulation, thereby limiting the scope of RECs to CSC. Currently, there is no clear perspective on CECs yet. In Spain, primarily the self-consumption scheme has been defined, not necessarily associated with any legal entity such as an energy community. However, collective self-consumption in Spain shows elements of RECs such as the possibility to use the public grid under defined conditions.

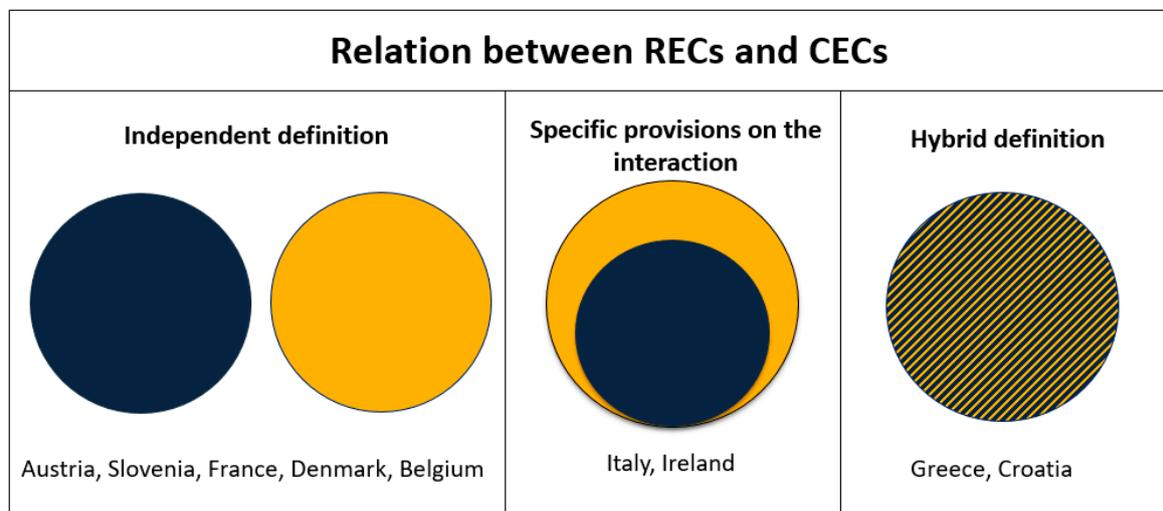
In Austria, as presented above, a CSC framework had already been established in 2017, independently from energy communities. RECs and CECs are defined separately but share a number of common features such as the options provided for the potential legal form. Despite their independent definition, energy communities build on the pre-existing CSC framework to an important extent, for instance regarding the role of the DSO in distributing the involved energy to the different parties.

In Greece, instead of a differentiation between RECs and CECs, only non-profit and for-profit energy communities are distinguished. While the Greek energy community framework resembles more the concept of CECs, it extends CEC activities to those of RECs (e.g., including thermal energy) and applies limits to their physical expansion. It also introduces the concept of CSC including local proximity characteristics (NUTS 2 regions [43]). CSC, however, is only foreseen in energy communities, rather than being covered by an independent framework. This hampers implementation of smaller schemes due to administrative hurdles. In addition, the inclusion of natural gas does not correspond to the scope of RECs and CECs as defined in the CEP.

Overall, regarding RECs and CECs, three approaches towards their differentiation or integration could be distinguished:

- (1) A completely independent definition of the different concepts;
- (2) Specific provisions for the interaction or integration of RECs and CECs; and
- (3) Hybrid definitions with either no differentiation fully merging the concepts, or major overlaps.

Figure 1 illustrates these approaches on the basis of some country examples. Croatia is a specific case, as it applies a CEC definition that includes REC restrictions but in addition defines RECs separately.



**Figure 1.** Relationship between RECs and CECs in different national transposition approaches.

### 5.2. System Boundaries—Physical Expansion of CSC and Energy Communities

While CECs are generally not limited in their physical expansion at the national level (cross-border cooperation is optional in the EU framework), the potential spatial boundary forms a major element for framing RECs. Even though the REDII does not restrict the physical expansion of RECs *per se*, it requires that RECs are “effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects”. This implies that a clear localisation of the involved renewable energy projects, and thus indirectly of the energy communities as such, is necessary. The specification of physical boundaries is fully left to the Member States.

In Greece, for example, the topology of the country is taken into account; on the mainland, the production station and consumption points must be located within the region where the energy community has its headquarters, except for Attica, where neighbouring regions are eligible for the production units. In the non-interconnected islands, the generating station must be connected in the same electrical system as the consumption installations. In practice, this means that the installation of both, production and consumption units must be within the boundaries of the island. In Austria, two different limitations of RECs relating to the energy system architecture are defined: Low voltage as well as medium voltage RECs. The scope may be chosen by the community, however leading to different levels of grid fee reductions (see below).

Some countries do not apply clear definitions and take decisions on a case-by-case basis. Wallonia introduced “local perimeters”, a term describing grid segments downstream of one or more MV/LV transformer stations. The definition of local perimeters, however, equally refers to a “technically, socially, environmentally and economically optimal” section of the grid for promoting local self-consumption. In addition, local perimeters are to be defined on a case-by-case basis, equally taking into account criteria such as the “quality of the participants” [19]. Also in Portugal there is no specific definition of the potential expansion of an energy community. Each case is evaluated by the governmental entity DGEG that will consider the following: the transformer substations involved, the voltage level of the consumers involved, and other additional technical and regulatory issues. These flexible approaches have pros and cons: on one hand, there are theoretically no projects that will be excluded a priori; on the other hand, the regulatory viability of a project is dependent on a response from the institutions in charge. For more complex projects, it is thus hard to assess their chances of recognition upfront. Flanders proposed that the participation in an REC is limited on the basis of technical or geographic proximity, also taking into account activities that the REC wants to carry out [19].

The draft Polish law takes a different approach providing that not more than three energy communities are directly adjacent to each other, while the number of members of an energy community should be less than 1000 [44].

None of the Member States foresee cross border cooperation for either RECs or CECs so far. A major reason for this may lie in the strongly differing energy community schemes which would need to be harmonised between Member States.

Regarding CSC, the REDII refers to “the same building or multi-apartment block” as well as to direct lines, however some Member States allow for CSC using the public grid. In these cases, CSC may provide a basis for the definition of corresponding rules for RECs. This is the case in Spain, as previously explained, as well as in France. France uses a spatial limitation of 2 km (exceptions: 20 km) [19]. In Spain, as described above, CSC schemes underlie a 500 m boundary and need to be located in the same cadastral area and in a grid segment below the same LV transformer station. Most Member States however limit CSC to multiapartment buildings [10].

Table 4 provides an overview of the different approaches to physical limitations of CSC schemes and energy communities.

**Table 4.** Overview of spatial boundaries for RECs and CSC schemes in selected EU Member States (own assessment, [19]).

| Country          | Approach to Physical Boundaries                     |
|------------------|---|
| Austria          | LV/MV   |
| Belgium/Wallonia | LV/MV and distance                                  |
| Belgium/Flanders | LV/MV and activity                                  |
| Hungary          | MV/HV   |
| Slovenia         | LV  |
| Italy            | LV /MV  |
| Ireland          | LV/MV   |
| Croatia          | Municipality, LV                                    |
| Lithuania        | Municipality  |
| Poland           | Municipality  |
| Greece           | Regional or system-related, depending on location.  |
| France           | Distance (up to 20 km) (only CSC)                   |
| Spain            | LV, cadastral area, distance (500 m) (only CSC)     |
| Portugal         | System-related, individual decisions (RECs and CSC) |

### 5.3. Activities of Energy Communities

Regarding the potential activities in the case study countries, in Austria, according to the current draft law, RECs will not only be able to generate, store and supply renewable energy but can also act as an aggregator and provide energy services. RECs as well as CECs can own and operate electricity grids but need to fulfil the same obligations as other DSOs. In addition, RECs are entitled to operate local heating grids.

In Croatia, CECs cannot own or operate distribution networks. Jointly acting active consumers may delegate the operation of production facilities to third parties, including installation and maintenance, without the third party being considered as a CEC member. In Portugal, RECs can, as stated in the Decree Law 162/2019, carry out activities basically replicating the wording of the REDII. However, as explained above, only CSC has been introduced so far, limiting the effective implementation of the rest of the stated activities. Spain also has no fully developed energy community framework yet, currently primarily focusing on CSC however allowing for electricity sharing via the public grid. The broad Greek framework for energy communities covers most activities referred to in the CEP, partly going even further, for example, through the inclusion of heating and cooling by highly efficiency combined heat and power (CHP) plants that use natural gas.

It needs to be highlighted that besides the general recognition of specific activities, a fundamental precondition to several activities is the integration of energy communities into the energy market and the physical energy system. To this end, enabling frameworks are required that do not necessarily specifically refer to the energy communities as such. This includes, for instance, the establishment of market structures for the trade of flexibility services. To date, many activities are not yet possible in most Member States due to a lack of suitable market frameworks but also due to technical constraints such as the roll-out of smart meters and the availability of relevant data. Thus, the full range of potential activities highlighted by the CEP is not yet feasible in any of the Member States.

### 5.4. Local Electricity Grid Tariffs

Among the current developments, a trend towards the definition of local electricity grid tariffs is apparent. Such tariffs generally apply a reduction to the electricity exchanged/self-consumed within the energy community or CSC scheme, while the tariffs for the remaining energy consumption are untouched. Even though we refer to “grid tariffs”, in some cases additional taxes and charges not related to the costs of the public grid are reduced. We refer to “local” tariffs, as the reductions in most cases apply in the context of localised CSC schemes or RECs.

Besides their supportive character, local grid tariffs are motivated by the requirement of the EU to set cost-reflective tariffs, which may entail the principle of only paying for the actual network-level used for distribution within the community [45]. Both motivations, support and cost-reflectiveness, are embedded in the EU framework, even though in different pieces of legislation (electricity market rules in the EMD, and the requirement to support RECs defined in the REDII). Due to their different nature a reduction of (1) grid-related fees and (2) other tariff elements should be differentiated.

While some countries develop local tariffs specifically for RECs (Austria, Belgium, Italy), other countries (France, Portugal and Spain) also allow CSC initiatives to use the public grid to which specific tariffs apply [19].

In Austria, reduced grid tariffs are foreseen for electricity sharing in RECs at MV and LV level. In principle, fees for using grid levels that are superordinate to the grid level in which the REC is located will be deducted for electricity exchanged within the REC. The tariff reduction will be defined as a percentage of the tariff in place at a national level for LV and MV communities applying to all network areas (in Austria, different tariff structures apply to the different geographical network areas). For the capacity-based share of the network fee, the power drawn from the public network will be reduced by the power drawn from the REC in the respective quarter-hour. In addition, the volumetric tariff element earmarked for renewables support, as well as an electricity tax are supposed to be deducted from the tariff. Due to the unknown impact of energy communities on the electricity system, the regulator is required to carry out a cost-benefit analysis by the end of the first quarter of 2024. Thereby, it is to be determined whether RECs, as well as CECs, contribute to an appropriate extent to the system costs or benefits. In particular, this has to include the costs for balancing energy [46].

In Croatia, the electricity market law stipulates that CSC schemes are subject to all grid tariffs for distribution and transmission of electricity. The tariffs are to reflect real costs, be transparent and non-discriminatory, and consider both, electricity delivered to the grid and electricity taken from the grid, ensuring an appropriate and balanced contribution to the distribution of total system costs. Surcharges for RES development are charged only for real-time net exported electricity.

In Portugal, CSC schemes have to pay a fee for the electricity shared between participants using the public grid. The tariff is based on the voltage level used. For consumers with an LV connection (below 41.4 kVA), the cost is based only on the volume exchanged. For larger consumers (above 41.4 kVA), there is an additional component based on the mean capacity used to share electricity during peak hours. In June 2020, Order No. 6453/2020 introduced a specific tax exemption explicitly for self-consumption [47]. This aid is valid for the first 7 years of operations and only for initiatives starting before the end of 2021. This exemption thus also applies to self-consumption within an energy community that has a self-consumption arrangement in place.

In Spain, new tariffs have entered into force in June 2021, both for power and energy, setting by default three periods (peak, neutral and valley), independently of any self-consumption. For CSC schemes, no grid fees are charged for the electricity exchanges within the scheme. In France, the choice of a specific tariff for self-consumption is optional and does not lead to a cost reduction in all cases. In Wallonia and Flanders, the government demands a cost-benefit analysis investigating the impact of energy communities on the distribution network, including avoided investments in the network. Based on these assessments, specific tariff reductions may be applied [19].

While in most cases a reduced local tariff would be granted upfront, REC members in Italy pay the ordinary tariff and are later reimbursed. The reimbursement electricity exchanged within the community corresponds to the consumption-based part of the network tariff covering transmission-related costs [19]. Table 5 shows an overview of the different tariffing approaches for RECs and CSC.

**Table 5.** Local grid tariffs in EU Member States (own research, [42]).

| Member State                | Network Tariff for CSC/REC  | Other Tariff Elements   |
|-----------------------------|---|---|
| Austria                     | No consumption-based grid fees for grid-level superordinate to LV or MV REC. Net capacity-based tariffs   | Removal of consumption-based renewables surcharges and electricity tax  |
| Italy                       | Refund of consumption-based part of network tariff, covering transmission-related costs   | No other tariff elements reduced  |
| Portugal                    | Consumption-based grid fees above the grid level of REC do not need to be paid  | Reduction of consumption-based surcharges (policy costs CIEG: 100% for CSC, 50% for individual self-consumption in the first 7 years) |
| France                      | Tariff for CSC  | No other tariff elements reduced  |
| Belgium (Wallonia/Flanders) | To be defined based on expected benefits  | To be defined based on expected benefits  |
| Poland                      | -   | Removal of consumption-based surcharges   |
| Spain                       | No grid fees for CSC within 500 m limit between production and consumption connection points (neither capacity-based nor consumption-based fees). | No other tariff elements reduced  |

As the reduction of grid tariffs for CSC schemes and RECs would entail reduced revenues for the DSOs, DSOs may want to compensate them via non-participating consumers. Care may need to be taken that this does not lead to a significant burden on other, potentially vulnerable, consumers [48].

##### 5.5. Allocation of Energy to the Participants

The allocation of energy to the participants of a CSC scheme or energy community is a core element for joint consumption/sharing. This requires the definition of responsibilities of different actors and the corresponding access to, and processing of the needed data. In addition, the time resolution of the allocation is of high relevance, affecting actual self-consumption levels in the community. This may reach from long-term net-metering (e.g., Greece) to short-term intervals such as 15 min.

In Austria, as set in the 2017 CSC scheme, the DSOs allocate electricity to the participants of energy communities based on a time interval of 15 min when using smart meters, according to a distribution key decided by the participants. Two allocation rules are foreseen: A static approach, attributing a fixed share to each participant, and a dynamic key, relating to the actual consumption of each participant. While the first alternative provides upfront clarity to all participants, the second option has the potential for higher self-consumption rates at the level of the community or CSC scheme. The DSO is obliged to communicate the quarter-hourly generation and consumption data to the electricity supplier(s) and the participants by the following day at the latest. The share of the electricity generated within an energy community that is allocated to a consumer has to be stated separately on the electricity invoice of the supplier. In Croatia, CSC participants need to provide the DSO with a list of all consumption, production and storage metering points included in the schemes, along with a distribution key that defines how the electricity is to be shared between the members. Billing periods are to be defined by the Croatian Energy Regulatory Agency (HERA). In Portugal, electricity is shared in a CSC scheme in 15 min intervals. To define how much electricity is delivered to each CSC participant, the managing entity of the CSC scheme (Entidade Gestora do Autoconsumo–EGAC) communicates a list of sharing coefficients that can either be fixed or proportional to the consumption of

each participant, similar to the Austrian approach. Using the defined sharing coefficients, for each 15 min period, the DSO allocates a share of the total production of the involved installations to each participant. The DSO is then responsible for communicating the final net electricity consumption, complementary to the self-consumption to each participant's retailer. In Slovenia there are no standard procedures yet for the DSOs for sharing and metering.

In Greece virtual net metering is the core of energy sharing implementation. Virtual net metering is the netting between the generated energy from a RES installation and the consumed energy of one or more consumption points when the generation installation is at a different location to the consumption points and not directly electrically connected with them. Within the scheme, various RES technologies can participate (PV, small wind turbines, small hydro etc.) and in the case of solar projects, the maximum installed power is limited to 3 MW [49]. If the generated energy exceeds the energy consumed, the excess energy is not reimbursed but transferred to the next metering cycle. The transfer of excess energy ceases at the end of every three years.

### *5.6. Legal Form of Energy Communities and CSC Schemes*

The type of legal entity that is allowed by Member States for forming an energy community is highly relevant to the business case of energy communities. For example, where operational costs may be too high for small initiatives under a specific type of legal entity, openness regarding the organisational form may be beneficial. On the other hand, pre-defining the organisational form is sometimes discussed among policymakers to facilitate implementation as it avoids dealing with possible complexities caused by 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.

A general distinction can be made between the proposed use of existing types of legal bodies, the prescription of a single, potentially new or adapted, legal form that may be specific to energy communities (e.g., Greece), or the definition of criteria without prescribing or proposing specific legal forms. The latter may be based on the criteria already defined in the EU framework, without further specification. Overall there is a tendency by Member States to define cooperatives as a preferred entity. Greece and Sweden (the latter in its consultation document) prescribe a specific legal body; while in Greece a specific type of cooperative is foreseen for energy communities focusing exclusively on energy-related activities, in Sweden, the formation of an "Economic Association" is planned. Slovenia requires CECs to be defined as cooperatives. Slovenia related this choice to the intention that the members of the energy community should not lose their rights as final customers. In Spain, a dedicated legal framework already exists for "Energy Consumption Cooperatives" (Cooperativas de Consumo), which could well serve for energy communities. Austria represents a case where the choice is left to the energy community; RECs and CECs can be organised as an association, cooperative, partnership or corporation, association of housing owners or a similar legal body. In Portugal, as well, and in other EU countries such as France, Belgium, Luxembourg or Lithuania, there is no pre-defined legal form to be adopted [19].

In Greece, the law on energy communities also provides for the establishment of larger structures at regional and national level. Specifically, a minimum of five energy communities based in the same region can establish an association of energy communities. In addition, energy associations all over the country can set up a federation of energy communities.

Collective self-consumption in most cases does not require the formation of a legal body but contracts between the participating actors are foreseen. Exceptions are France and the Brussels Capital Region, where producers of a CSC scheme also need to be organised in a legal entity [19].

While participation in energy communities is to be open and voluntary according to the EU framework, this does not necessarily mean that joining and leaving an energy

community is possible at any time. Luxembourg and Poland, for example, foresee a minimum duration for participation in a REC of one year [19]. In other countries, membership conditions will be defined, for instance, in the statutes of cooperatives or other legal bodies.

### 5.7. Effective Control: Definition and Proximity Concepts

The REDII requires that members or shareholders of RECs exercising effective control need to be located in proximity to the renewable energy projects. This does not, however, require that all members or shareholders need to fulfil the proximity requirement. The definition of the localisation and physical expansion as such, as shown above, and the criteria defining proximity as regards to effective control, are left open in the directive. Regarding the definition of “effective control”, the recast of the EMD includes a definition of “control”, referring to the possibility of “exercising decisive influence on an undertaking, in particular by (a) ownership or the right to use all or part of the assets of an undertaking and (b) rights or contracts which confer decisive influence on the composition, voting or decisions of the organs of an undertaking”.

Some countries cover the governance-related proximity aspect by requiring that a majority of the members must be located in defined spatial boundaries or have, for example, property in these areas. In other countries, the locational requirement applies to all members. For instance, Lithuania provides that 51% of members need to be residents in the municipality of the production plant or a neighbouring municipality [19]. In Greece, equally, 50% plus one of the energy community members are expected to have local ties with the district of the energy community’s headquarters. In case of individuals ‘local ties’ refer to local ownership or the right to use immovable property or official registration as residents in the concerned municipality. For legal entities the local relation to the energy community requires the headquarter of the participating entity to be within the district in which the energy community has its headquarter. That means the requirement to have local benefits is well met, also regarding the protection from “external” investors without local ties to guarantee economic benefits for the members and increase the local economic value.

Obviously, if membership and/or shareholding is entirely limited to specific spatial boundaries, the governance-related proximity aspect as foreseen in the REDII is addressed at the same time. This, however, fully excludes members or shareholders located outside of the local REC even if they do not carry out effective control. Whether this causes relevant practical constraints remains to be seen; membership or shareholding outside of the local area of the REC may be of less interest without participating in the effective control.

### 5.8. Autonomy

The concept of autonomy overlaps with membership criteria to the extent that the power of individual members may be limited. A few countries have already defined more specific membership criteria and procedures limiting the power of individual members or types of members. In Lithuania, at least five members must be natural persons, holding a minimum of 51% of all votes [19]. In Greece a minimum number of participants is required for the establishment of an energy community; between two and 15 members depending on the nature of the participants and on whether the community is profit-oriented or not. Besides voting rights or membership criteria, some countries limit capital shares of individual members. This is foreseen in the Greek law that provides for a cap on the participation rate of each member in the cooperative capital of 20%. Only municipalities may participate in the cooperative capital up to a limit of 40%. Autonomy from external market actors is also considered in Lithuania, where a member cannot have shares in another energy producer of more than 20% [19], in Croatia that share is planned to be 40% [44].

It needs to be noted that a specific corporate law may specify governance aspects such as autonomy. In addition, rules on decision making in corporate laws may define requirements related to autonomy criteria such as the limitation of corporate shares. Also, minimum membership numbers may be defined in such frameworks. In Portugal, for

example, a minimum number of four members is required in a cooperative. In contrast, the Portuguese Decree Law that introduces the REC concept states that these organisations must be autonomous from their members or partners, but effectively controlled by them. It does not, however, identify or provide a specific regulation to guarantee these conditions. Thus, corporate laws may be equally or even more important for requirements such as autonomy than the legislation on CSC and energy communities themselves.

#### 5.9. Ownership of Installations in RECs

As per the REDII definition, the renewable energy installations of RECs shall be “owned and developed by that legal entity”, that is to say, by the energy community as such. “Ownership” may, however, be interpreted differently and may lead to different rules regarding the legal relationship of the communities to “their” installations. For instance, in the case of Austria, ownership will presumably not be defined in terms of civil law but rather refer to “economic or operational ownership”, allowing some sort of control over the installation by non-community members. Specifically, the explanations to the law underpin this interpretation by explicitly stating that contracting and leasing arrangements will be possible [46]. Also in Portugal, different options for an “external” ownership, including contracting, are discussed, where the energy community may be responsible for the operation while the involvement of external investors would be possible. In Greece, in contrast, the installations must be owned by the community, that is to say, the cooperative. The interpretation of ownership thereby follows the cooperative model where the membership equally determines what shares of the installations are held.

External investments, such as through contracting, could be supportive, as access to funding is often difficult. This may be of even more interest when vulnerable consumers are to be involved who lack investment capital. For instance, in Portugal, in some currently developed initiatives, some of the participants receive a social electricity tariff. On the other hand, it may need to be discussed what economic and autonomy-related impacts external investments may have.

#### 5.10. Addressing Vulnerable Groups and Energy Poverty

So far, only Greece has embedded the reduction of energy poverty as a prime goal of energy communities into its legal framework, also establishing specific measures, while Portugal is planning to do so. Bulgaria and Hungary have also declared their intentions to put a focus on energy poverty in forthcoming legislation on energy communities [19]. In particular, the inclusion of vulnerable or poor households in the Greek virtual net metering scheme without requiring membership in the energy community may be a powerful approach to reducing barriers for these groups. In the other cases, where such specific options are not defined in detail, further national transposition and actual community-level governance will need to address the question of access of vulnerable households to the benefits of energy communities. This means that in most cases, the concept of “open and voluntary” participation still needs to be broken down into specific rules and measures. For instance, the need to become a member of an energy community by purchasing a share, for example, of a cooperative, or the requirement to participate in joint investments may significantly hamper the involvement of vulnerable groups. In Portugal, the national long-term strategy to fight energy poverty was recently undergoing a public consultation. It suggests the establishment and development of energy communities as a way to tackle energy poverty. However, there is still a lack of definition of concrete actions or measures.

Generally energy agencies and municipalities in several EU countries showed high interest in creating energy communities with the goal of tackling energy poverty. This includes besides potential cost savings through self-supply, help for vulnerable members with their energy bills by providing services and education on reducing their consumption and using revenues from renewable energy generation to improve the living standards of vulnerable and low-income households. The Estonian 2030 Tartu city energy and climate plan for example addresses the issue explicitly by stating that to alleviate energy poverty at the

municipal level, the city aims to support the establishment and promotion of RECs [50]. Still, fixed coefficients for energy sharing and the lack of possibility of a flexible energy sharing policy in some countries might present an obstacle to the solutions envisioned. For instance, flexible rules could allow the supply of surplus energy to vulnerable households. In some EU countries, such as in Austria or France, there are discussions suggesting that energy communities can also create unfair economic imbalances in the system, creating a risk of high system charges for vulnerable groups [51]. For instance, a study was carried out for the Austrian chamber of labour in 2021 assessing the social impacts of potential higher surcharges for consumers not participating in energy communities due to reduced (grid) tariffs for RECs [48].

The importance of considering social aspects in the energy sector also becomes apparent in light of current market developments. The electricity price in the European wholesale markets is escalating and reaching historical maximum values across the continent [52] mainly due to the rise of the natural gas and CO<sub>2</sub> emissions prices. As an example, Spain is suffering one of the most severe peak prices during the last few months, achieving hourly clearing prices of over € 180/MWh and average daily prices of over € 170/MWh [53]. At the other end of the electricity value chain, the regulated tariff for individual consumers in Spain has been switched from single-price to an hourly variable tariff indexed to average historical values of the pool price [54]. This, along with the electricity price increase, is reflected in higher electricity bills for citizens. Energy communities may thus also play an important role in decreasing the dependence on international and more volatile electricity markets, as one of the key pillars of the energy transition.

## 6. Discussion

In this paper, we have investigated how national transpositions may support or hinder the implementation of energy communities and collective self-consumption schemes as defined in the CEP. This includes the contribution of these new concepts to the broader goals for citizen empowerment and the energy transition. We largely limit the analysis to these concepts while a high number of other citizen-driven/bottom-up energy initiatives exist. We also acknowledge that the term “energy community” has been widely used even before the adoption of the CEP. Therefore we also consider in the discussion of our findings other literature that takes a broader look at institutional frameworks or the need for wider types of initiatives, raising questions on the very nature of the EU definitions.

The analysis showed that there are different starting points and energy system needs in the Member States. Some Member States, such as Austria and Spain, have existing approaches and organisational structures for collective energy action in place on which they can build. Other countries, such as Croatia, are primarily driven by EU legislation rather than having a clear vision of how to integrate the new types of initiatives into the national context. There are observations on several major aspects that are further discussed in this section: (1) the overlap of concepts (2) physical boundaries of RECs and CSC (3) support and system integration, (4) data access and (5) ownership.

As this paper has shown, the current state of transposition comes along with important overlaps between the different concepts defined in the CEP. In particular, some EU Member States do not differentiate the two types of energy communities or integrate collective self-consumption within the energy community framework. It remains to be seen whether a lack of differentiation may lead to compromises and potential practical barriers due to the significant differences according to the EU framework. For instance, the case of Greece already shows that major hurdles may occur because CSC is only allowed within the framework of energy communities. In some countries, RECs and CSC are interwoven, such as in Portugal where RECs are part of the self-consumption legislation. At the same time, it needs to be considered that national circumstances, including pre-existing national initiatives and mechanisms, may overlap with the new frameworks. Thus, a good fit within the national context is of high importance. In some cases, it may be useful to integrate the new concepts with the existing mechanisms in place rather than defining

new, independent legislation and regulation fully corresponding to the EU definitions. An artificial differentiation, strictly focussing on a 1:1 transposition could, depending on the context, lead to potentially inefficient overlaps or competing frameworks and a plethora of different mechanisms. For instance, while we identified a high degree of integration with pre-existing legal concepts in previous research (e.g., in [19] for Ireland), the Swedish draft for an energy community framework was criticised for not clarifying the relationship between existing cooperatives and the new energy community concepts [55]. An important criterion for the chosen approach may thus include the recognition of pre-existing initiatives, with the aim of integrating these in the best way into the new frameworks [51]. A strict formalisation of energy communities according to the EU provisions however raises a range of open issues and is questioned by some authors. According to Horstink et al. [12], the need for formalisation of energy communities as foreseen by the CEP constitutes a dilemma as it requires a choice between different types of initiatives. This could hinder rather than stimulate the expansion of civic-inspired prosumer initiatives. Also, there would generally be a mismatch of policies with the needs of different RES prosumer types [12]. Palm concludes that too-narrow definitions may exclude different types of initiatives and discourage newcomers [14].

It is worthwhile to discuss critically the practical implications of physical boundaries of RECs and CSC. The choice of a system-related boundary based on the network structure has a practical relationship with the definition of local grid tariffs and the financing of the distribution (and transmission) system. At the same time, information on the precise network architecture may not be easily available for planners and local initiatives. System-related limits may however be located between, for instance, two neighbouring buildings within the same municipality. This may lead to major restrictions for participation which may not easily be apparent. In contrast, choosing distances as a physical boundary would be much more transparent for the general public and may expand over several municipalities (as opposed to e.g., postal codes) but ignore the infrastructure aspects. The cases of Portugal and Wallonia are interesting in this sense, as it will (for now) be decided on a case-by-case basis whether a potential REC can be considered as such. This provides room for individual spatial limitations and for gaining practical experience. At the same time, a lack of planning certainty may be an issue for the developers.

The different types of support and, in particular, the different approaches to local (grid) tariffs have different aspects: They support the establishment of CSC schemes and energy communities and may, to some extent, address the requirement for the cost reflectiveness of tariffs (i.e., grid fees are only paid for the grid segments that are actually used for the community-internal exchange). On the other hand, the defined approaches are relatively static and implicitly or explicitly assume that maximisation of (local) self-consumption serves the system. This is at odds with a more dynamic system integration of RES as may be addressed through flexibility markets or the development of price signals such as dynamic tariffs. However, to make full use of such mechanisms, major reforms of the market structures are still outstanding. Also, analyses of actual system impacts of energy communities, as requested in the EMD, are largely still pending. Thus, setting the right incentives still lacks sufficient data and analysis as a basis. In addition, harmonising different tariffing and system-integration options with social questions would be of high relevance. The assessment of related impacts in this area is not yet advanced, either. Specifically, the reduction of energy poverty as one of the goals in the CEP is, so far, hardly addressed in the current national frameworks with the major exceptions of Greece and, presumably, Portugal.

The trend towards local grid tariffs may also to some extent prevent discussions about other tax and levy-related support. While these are partly introduced in conjunction with grid tariff reductions, this link is not necessarily to be taken for granted. While, for example, renewables support levies are often charged in connection to grid fees, reducing these elements could be applied independently. This could lead to a more differentiated approach. For instance, where CECs focus on renewable electricity generation, applying

exemptions from renewables support levies may be justified just as for RECs. Due to the difference in geographical scope, however, local grid tariffs related to the actual use of the public grid would not apply to CECs, or at least not to the same extent.

A prime technical and regulatory challenge is access to relevant data due to the incomplete roll-out of smart meters, administrative hurdles for data access, and the general rules for access to data. The central role of the DSOs in providing metering data currently often leads to difficult procedures and a lack of real-time data with a suitable time resolution. The latter would be required for a community-internal optimisation and services building on, for instance, demand-side management. A broad system and market integration, as also discussed above, is thus currently not in sight. While this issue partly even affects the “basic” activity of CSC, it is of prime importance where any type of local optimisation is aimed for.

The discussed approaches to ownership constitute another debatable aspect. Allowing a major role for professional companies via, for example, contracting may contribute significantly to solving the problem of lack of bankability or liquidity of energy communities. At the same time, the autonomy of the community may also be affected in financial terms. The actual impact of such approaches will depend on the specifics of the business model.

Generally, while we primarily focus on regulatory frameworks, recent literature suggests that the success of energy communities and prosumer models will depend on a high number of additional factors. These include, for instance, the trust of participants, the status quo and reforms of the energy system and market structures, the existing landscape of civil organisation, the match of policies with the needs of prosumers, and potential organisational weaknesses [12,14]. These aspects could only partly be touched upon in this paper. The paper thus does not cover the full complexity of success factors for energy communities and CSC schemes. It rather attempted to identify major lines of national transposition and its progress as well as the resulting implications for practical implementation and the contribution to the aims of the CEP.

## 7. Conclusions

The analysis has shown that the current status of transposition of the EU provisions is highly diverse and represents different degrees of ambition and fitting into the national context. Overall, even though several countries are quite advanced in the transposition of the provisions specific to CSC and energy communities, the longer-term perspectives including broad energy system integration as well as goals such as the reduction of (energy) poverty are, to a large extent, not yet addressed. The development of accompanying measures, such as the establishment of one-stop shops, is only at the beginning. Even though the deadlines for the national transposition of the recast EMD and the REDII have passed by the time of publication, national frameworks considering the full spectrum of the directives and the wide implications for the energy market cannot be expected in the short term. Stepwise implementation and review processes, as partly explicitly defined in the national frameworks, suggest a longer-term learning, development and adaptation process over the coming years. In this context, avoiding a lock-in into frameworks that are not future proof may be an important challenge.

In the end, the developed frameworks will need to materialise as attractive (business) models for the involved actors. The complexity of the energy system and market stands vis-à-vis the involvement of actors that are, by definition, not professionals in the energy sector, generally requiring low entrance barriers. The CEP thereby attempts to attribute a major role for the energy transition to non-professional actors that could be supposed, with exceptions, to be the weakest element of the energy value chain. Bridging this gap, including through the involvement of, for example, municipalities and professional services-providers, without undermining the expressed requirement for autonomy can be supposed to become another major hurdle in the broad roll-out of additional CSC schemes and, in particular, energy communities. This would equally require suitable and appropriate support of emerging initiatives.

Due to the complexity of the matter and highly differing national contexts, the question of whether a country is on the right track may not be measured by strict implementation of the EU provisions on CSC, RECs and CECs but rather by a successful embedding in the national context and the broader establishment of suitable and supporting framework conditions. An answer as to whether current developments are going in the right direction can only partly be given ex-ante. The analysis, however, shows that many major decisions are taken now or have already been taken. Seemingly small details of the national legal and regulatory frameworks may have fundamental impacts on the actual feasibility of energy communities and CSC schemes. The discussed barriers will need to be carefully addressed if the high expectations for the role of energy communities and CSC schemes are to be met.

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