



Managing renewable electricity within collective self-consumption schemes: A systematic private law approach

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ARTICLE INFO

Keywords:

Collective self-consumption
Distributed energy generation
Renewable energy
Peer-to-peer trading
Energy sharing
Energy communities
Electricity market
Consumer empowerment
Private law
Property law
Contract law

ABSTRACT

The EU electricity market reform has created new opportunities for citizens to be involved into market dynamics as active customers. A new set of rules entitles people to collectively become self-consumer of renewable energy, which means to consume the electricity produced by production units located on different sites from where they operate or live, conferring them rights and duties which can be exercised either individually or collectively. Whenever two or more grid users are committed to produce and consume renewable energy within a limited area of the public grid corresponding to the same electrical substation a collective self-consumption scheme (or CSC scheme) is formed, regardless of any formal structure and qualification they have. According to the EU Law, electricity exchanges carried out within a CSC scheme can be classified in terms of sharing or trading, even though both reflects the same physical phenomenon on the grid. However, the EU directives does not provide strong elements to draw the line between such concepts. In addition, literature reviewing highlighted that there is not a clear understanding of what exactly distinguishes trading from sharing of electricity. Such distinction has relevant consequences in Law, including for what concerns a value-oriented analysis between individualism-based and pluralism-based models. Moving from these premises, this study aims to examine whether the private law might be able to provide instruments to address such distinction.

1. Introduction - many collective self-consumption schemes, one purpose: empower EU citizens

The EU Directives 2019/944 on *common rules for the internal market for electricity* (IEMD) and 2018/2001 on *the promotion of the use of energy from renewable sources* (REDII) have designed a new electricity market scenario by moving from a centralized structure to a decentralized one based on renewable sources. According to the EU law, citizens are now allowed to produce renewable electricity for their own consumption, store and sell the excess of production, switching from being simple passive consumers to play an active role in the electricity market. Such radical overturn empowers people to give a concrete contribution to the energy transition either by acting individually, as single self-consumer who simply feed the self-produced surplus of electricity into the public grid, becoming a “prosumer”, or, conversely, by organizing production and consumption with other grid users, through innovative collective schemes, with the purpose to allocate in a given manner the economic benefits gained from feeding the energy surplus in the public grid. In such cases, at least from the grid perspective, when production matches consumption within a restricted area of the public grid, where

participants are connected to the same voltage cabin, a collective self-consumption scheme is formed, regardless of any formal legal relationship citizens want to set up [1–3]. The growth of RES prosumerism all over the Europe is challenging the current energy market structures and institutions, since it has the power to scale back the role of the traditional energy players [4].

The IEMD points out that a competitive electricity market at the EU level should consider the role of consumers, since a large active participation can strongly affect price signals and contribute to lower energy costs, thus providing affordable renewable energy for all consumer categories, especially for low-income households. Nevertheless, in many cases people have not enough resources neither to directly invest in PV plants, nor to provide a financial contribution to develop collective energy projects [5]. Such issue, which invests lots of EU citizens and regions, and which is also expected to grow after the energy crisis triggered by the Russia-Ukraine war, might prevent them to target the electricity market as active players and to get all benefits from the opportunities granted by its new design. To overcome such inconvenience, the *Clean Energy for All Europeans Package* (CEP) has provided a broad range of solutions which allow citizens to act collectively in order to

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<https://doi.org/10.1016/j.rser.2023.113896>

Received 14 March 2023; Received in revised form 2 October 2023; Accepted 13 October 2023

Available online 16 October 2023

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achieve the energy autonomy through renewable sources, helping them to reach local sustainable development goals. To do so, the EU policy pointed out the relevance of the social dimension which stands behind the energy transition. Such target, concretely, requires member states to implement national support schemes for RES and to foster this process from the bottom by increasing consumer choices. In light of this, the transition to RES should not forget the role of consumers since it is crucial for a just transition to the energy democracy [6,7].

Both REDII and IEMD have introduced the so called “collective self-consumption schemes” (also known as “CSC schemes”), which are innovative market configurations that offer EU citizens the opportunity to cooperate in local electricity production and consumption projects by using the public distribution grid. For the purpose of this article, the term “CSC scheme” is used to describe a group of citizens who self-produce and consume electricity for their own, and who are located into a restricted area of the public grid since they are connected via the same voltage electric substation [8]. This phenomenon normally reflects on a virtual metering dimension what is assumed to happen when production meets consumption within the public network, given that, in such cases, it is not possible to actually track, on a real basis, electricity flows and exchanges among users. While the notion of CSC schemes embraces a set of solutions which all aim to empower EU citizens [9], what remains unclear is whether the electricity exchanges executed by participants should be always qualified in terms of *sharing* or *trading*, or even both. In this regard, the EU Law does not provide a clear distinction between these concepts, which are often overlapped by scientific literature, as well as considered like two sides of the same coin. This issue is essentially due to a lack of the EU Law, which does not outline properly the boundary between sharing and trading of renewable energy.

In addition, the analysis of the literature delivered in recent years highlights a frequent misleading use of these terms, especially when adopted to qualify as “trading” the electricity shared within Renewable Energy Communities (REC), and, on the other, as “sharing” the exchanges undertaken through Peer-to-Peer trading platforms. Indeed, several academic publications, mainly from an economic or technical-based perspective, consider *sharing* and *trading* as equally suitable to describe the energy exchanges within collective self-consumption schemes [9–14], while others, conversely, adequately distinguish these concepts [1,15]. Dealing with this ambiguity becomes much harder if it is considered that, looking at the public grid infrastructure, both terms essentially reflect the same physical event. In both cases (*sharing* and *trading*), the surplus of renewable energy is fed into the public grid, and, at the same time, it is consumed by other network users which are located in the same area and (conventionally) connected under the same voltage electric substation. As already noted, both phenomena become “*essentially a matter of a virtual exchange rather than an actual exchange since the distribution grid is always there to connect both users and prosumers, regardless their membership to specific energy community*” [13,16–19].

To address such concerns, this article brings forward a methodology based on a private law approach, which aims to examine the legal background of *sharing* and *trading* through a comparison under some relevant private law categories, assessing those private relations which mostly feature each CSC scheme. The reason which stands behind this choice is well explained if it is considered that both, *sharing* and *trading*, involve a considerable batch of rules between market actors which are set under private law principles. Consequently, to find out differences it is necessary to investigate the legal basis, addressing those elements (production unit allocation; distribution strategies; participants’ purposes) which feature each single CSC scheme. Such approach, also, lends to fulfill the second goal of this study, which is to carry out a value-oriented analysis between individualism and pluralism-based models, because it strongly helps to figure out which of those CSC schemes are mainly suitable for profit or non-for-profit purpose. In this regard, this complementary assessment reveals which scheme mostly reflects the pluralistic approach instilled by the EU policy.

These categorisations under the private law, indeed, might be helpful for both the policy and academic debate because aim to fill the gap of the uncommon understanding of these concepts for the implementation into national frameworks. From a practical point of view, this approach might overcome those difficulties which Member States are currently facing during the transposition process by adopting common legal categories, which better explain the core of these European-derived instruments in order to provide affordable and reliable legal instruments to EU citizens and enhance them as the centre of the energy transition.

2. The empirical background: the grid perspective

Before dealing with the abovementioned private-law categories, it is crucial to account the factual dimension which stands behind those legal arrangements whereby each CSC scheme operates. As properly argued, *«when a legal definition for a technical concept is needed, a specific reflection is mandatory»* [8,20]. In light of this, the following premise aims to provide some preliminary notions to figure out which features strongly affect the taxonomy of CSC schemes, and, consequently, which of these are better suited to face the distinction between *sharing* and *trading* of renewable energy from the proposed private law approach. Moreover, it is also important to highlight that this article does not aim to cover any research area related neither to the grid infrastructure nor to its function or management, considered also several literatures contributes already available which provide in-depth analyses of such profiles [8,21,22]. Nevertheless, a study which starts from the empirical background is recommended to strengthen the legal understanding of these innovative schemes provided by the EU Law.

Firstly, it is worth to explain which of those configurations mentioned by REDII and IEMD can be included into the “CSC schemes” nomenclature for the purpose of this paper. As pointed out before, a CSC scheme operates within a conventionally-restricted area of the public grid where, at the same time, users are feeding and consuming renewable energy produced by their installations, regardless of any legal relationship set between them or between them and RES facilities. In such cases, the major benefit comes from a less usage of the high-voltage transmission network, since energy exchanges are executed within the same minor voltage range [23]. According to this definition, a CSC scheme can be formed either via a Jointly-acting renewable self-consumers (JARSC), which is limited – *ex se* – within a specific geographical boundary [24], or a Citizen Energy Community (CEC), or a Renewable Energy Community (REC), or, furthermore, a Peer-to-Peer trading (P2P). With regard to the three latter cases, even though the EU legal framework does not specify how large can be the area where they operate, all of these configurations might be designed under restricted market perimeters and parameters in order to provide benefits from less grid imbalances and losses, which means the possibility to be charged with lower network costs, or even getting revenues for flexibility services offered [25]. For instance, considering the Italian legislative decree no. 199/2021, which transposed the REDII into the Italian framework, the grid perimeter devised to compute what is called “virtual self-consumption”, which is supposed to provide the aforementioned benefits for the grid, is the high/medium voltage electric substation. Within this grid-field, which can collect thousands of producers and consumers, matching production and consumption provides direct benefits for the local grid and, indirectly, for the whole public transmission network [23,26]. In addition, from another side, a restricted grid perimeter makes easier local-scale engagement, especially where municipalities are involved to strengthen the sense of community and cooperation and/or to provide financial and technical support to the initiative. This paper, consequently, does not consider aggregation schemes – typical and atypical – over larger perimeters, which the IEMD allows under broader ranges, where a huge amount of load and production profiles can be put together at any electricity market level [27].

Second, all CSC schemes mentioned by the EU Law mainly operate

under conventionally-delimited areas of the public grid through virtual metering schemes, which essentially are ways to allocate among participants the surplus of the energy fed into the grid to ease the cost of electricity bills [16,28]. In a nutshell, electricity exchanges executed between grid users are tracked on a virtual metering dimension, which reflects what is supposed to happen within the public grid. This model, which requires an active participation from DSOs to provide accurate datasets [29], is generally preferred due to its attitude to avoid massive investments, which are normally required in case of new private grids. In other words, each CSC scheme set under such metering frameworks reflects on a virtual (legally relevant) background what is assumed to happen into the public grid when, at the same time, someone is feeding renewable energy and someone else is consuming it. The value of the overall energy trade-off scored during an established time-window is then allocated through different distribution mechanisms, which feature each CSC scheme. These distribution mechanisms are designed and executed under private law agreements, which affect the different qualification between *sharing* and *trading* models. Such features will be examined in the following paragraphs. What is relevant to note here is that, from this perspective, there is no difference between *sharing* and *trading* of renewable energy « *since the distribution grid is always there to connect both users and prosumers* » [16], regardless of any established formal relationship.

Third, some authors are used to refer to P2P, often operated through blockchain platforms, as a means to provide CSC participants real-time detailed metering data (sometimes linked with interactive smartphone apps), corresponding to their virtual electricity exchanges [30]. This service, usually offered by a third-party platform provider, is complementary for CSC participation in view of an accurate execution of the distribution arrangements, other than an optimization of the energy flows. Nonetheless, such mechanism shouldn't be confused with P2P trading itself, as mentioned by the art. 2, par. 2 n. 18), REDII, insofar as the electricity surplus is not actually sold between CSC participants, platform users are neither sellers nor buyers, and platform operator's goal is limited to provide a real-time based dataset to handle and optimize network exchanges rather than to operate a virtual bid-matching mechanism to reduce energy supply costs on local-scale market. Hence, it appears reasonable that in such cases the use of the term "P2P" is due to the possibility to track on a virtual metering scheme – real-time or near-real-time – the renewable energy exchanges among CSC participants who operate under equal positions and conditions (peers), sometimes granting them with so called "token" or "crypto" assets which have no reference to any real market currency [31]. Consequently, at least from this perspective, the adoption of a certain metering support technology shouldn't affect the qualification between *trading* and *sharing*, since, on contrary, the choice between such digital services strongly depends on the adopted CSC mechanism itself (*trading* or *sharing*).

These arguments, in the end, suggest that to distinguish *sharing* from *trading* it is necessary to go beyond the technical perspective, moving to an in-depth analysis on those private-law categories which feature the legal structure of each CSC scheme. As long as the present study focuses on those CSC schemes which are considered "typical" under the EU Law, especially if compared to other aggregation models which can be implemented due to the freedom of contract principle, these characteristics may appear easier to detect if the CSC schemes are examined in the context of those Law provisions which are expressly related to typical *sharing* and *trading* configurations.

3. The law perspective

The EU Law does not provide an accurate distinction between *sharing* and *trading* within CSC schemes [9]. However, unlike *sharing*, *trading* of renewable energy is expressly mentioned by the REDII in relation to a specific scheme called "Peer-to-Peer trading", which the Law defines as "the sale of renewable energy between market participants" [1,10,32,33].

The power to sell renewable energy through P2P trading is also mentioned by the REDII as a means to manage the excess of production for a renewable self-consumer (RSC) [34], who is a final customer that "generates renewable electricity for its own consumption" [35] from production units owned by such RSC or, at least, which are under his control, as required by the art. 21, par. 5, of the REDII.

The major benefit for citizens engaged in P2P trading comes from dynamic price mechanisms whereby buyers and sellers can choose at least two market levels to trade energy or to be supplied: national or local market. According to the literature delivered in recent years, P2P trading « *allows self-produced energy to be traded among different points-of-delivery, or with the wholesale market, and the exchanged energy volume and price to be defined autonomously* » [10,16,36,37]. The scope of such scheme is essentially to improve an efficient allocation of the overall surplus of self-produced electricity through interactive pricing and trading mechanisms, which tend to balance demand and supply to achieve a competitive and efficient local market and to reduce the stress on the grid [37]. According to the EU Law, prosumers and consumers can undertake P2P trading "by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction". In the last few years, this became feasible also due to the development of smart contracts and blockchain technologies, which have equipped P2P configurations with innovative tools to allow participants to directly bid and purchase electricity as peers [38]; even though, in case of the public grid, as stated above, electricity tracking remains a virtual computation, instead of a real one.

Considering each single transaction executed between prosumers and consumers, P2P trading can be conceived as a well-known contractual structure where "peers" can only be sellers and buyers of renewable energy, reflecting a common trade scheme, i.e. a synallagmatic paradigm, between two parties with opposite interests. In this sense, participants are engaged in a one-to-one private relation (seller-buyer). Nevertheless, this does not entail that the legal background which allows P2P trading can be restricted, *sic et simpliciter*, to peers who trade electricity. On contrary, as already argued [10,38,39], to make it operating with an acceptable level of reliability, P2P trading – especially when operated on blockchain platforms – requires a complex of arrangements which include clauses to keep together a matching loop mechanism between demand and supply, a price mechanism, and a delivery loop [10], involving at least 4 categories of market participants: sellers, buyers, DSOs and platform providers.

On the other side, *sharing* is not autonomously listed and described by the EU Law as a means to manage renewable electricity between prosumers and consumers. Rather, instead of a detailed description of what *sharing* is, the analysis of the EU Law reveals a fragmentary use of this term, mostly in relation to specific CSC schemes (CEC; REC; Jointly-acting RSC) [15]. However, there is no evidence in the Law to argue that *sharing* and *trading* can be completely overlapped, as if they were the same thing. On contrary, it is quite true that the EU provisions suggest to properly distinguish these two concepts, especially if referred to those CSC schemes where *sharing* and *trading* are alternatively possible means to manage electricity among participants.

To this extent, it should be firstly considered that the REDII allows RSCs to act individually (i.e. as *prosumers*), conferring them the power to undertake those activities listed from lett. a) to d) of art. 21 par. 2, or to do so *jointly*. According to the par. 4 of article 21, whenever two or more RSCs are located "in the same building, including multi-apartment blocks" they can collectively undertake all activities listed by the paragraph 2 for RSC (*generate; store; sell*), and, in addition, they can also "arrange *sharing* of renewable energy that is produced on their site or sites between themselves". From the grid perspective, the range of activities mentioned for RSCs who act *jointly* clearly reflects a double dimension which confirms that *sharing* and *trading* cannot be alternatively and equally used to label the same phenomenon. In this case, indeed, these terms are referred to different circumstances. What follows shall clarify this statement.

With no regard to a specific regulatory framework implemented by

MS, acting together to generate, store and sell renewable energy means that such activities are executed behind a single virtual metering point, otherwise it would not be reasonably explainable why the Law expressly distinguished an individual way from a collective one to do so. Looking at the external side of such collective configuration, the EU provisions point out that the excess of the jointly-produced renewable energy can be sold to the public grid “*through renewables power purchase agreements, electricity suppliers and peer-to-peer trading arrangements*”. Therefore, these options are alternatively allowed in a collective manner because the par. 4 expressly references to the art. 21 par. 2, which concerns the single RSC. Consequently, whenever RSCs act jointly to produce renewable energy, in accordance with the par. 4, they should be considered as a single (virtual) producer who can exchange the surplus of electricity on the grid. Conversely, from the internal side, the term adopted by the Law to qualify the electricity exchanged among them (“*between themselves*”) is *sharing*, highlighting a clear distinction from those flows which invest the external side. Such distinction is conceptually possible to the extent that *sharing* and *trading* are not considered equally interchangeable terms.

Furthermore, there is another provision which is conducive to the reading highlighted above. The art. 16 of the IEMD mentions a broad range of activities that can be carried out by a CEC. In addition to those mentioned by the art. 21 of the REDII for RSCs who act collectively, indeed, CECs can undertake the control of the distribution network wherein they operate, even though this will result the only task to support, for instance, P2P trading exchanges between members of the community [8,17,40]. For such cases, CECs may turn out a suitable instrument to engage IoT services from third parties (or to directly provide some as well), or, also, to transfer to a legal entity, the CEC itself, the “*financial responsibility for imbalances*” caused by *peers* who act as active customers [41]. Such chance seems to be endorsed by the fact that the art. 16, par. 1 lett. c), of the IEMD establishes that “*members or shareholders of a citizen energy community*” can be, alternatively (emphasized by the use of the “or” conjunction), “*household customers or active customers*” [42], depending on the role undertaken, e.g., into a P2P scheme (consumer or prosumer).

On the other hand, the art. 16 itself establishes that community members can also arrange “*the sharing of electricity*”, whenever production units are “*owned by the community*” and provided that they maintain “*their rights and obligations as final customers*” [43], with no mention to the *active customer* category. The latter statement would appear clearer if it is considered that when the electricity comes from production units *owned* by such CEC, since only in this case it can be labeled as “*self-produced*”, the legal entity itself assumes those rights and obligations listed for active customers [44]. Hence, if *sharing*, unlike *trading*, does not automatically entail, at the individual level, rights and obligations as active customers, it appears reasonable to conclude that these two terms cannot be neither overlapped nor considered equally viable to describe electricity exchanges within CSC schemes.

4. The property law perspective

The analysis of the EU Directives did not provide strong elements to come up with the proposed question, despite of the outlined conceptual distinction which, however, remains on a theoretical level. At the same time, anyway, it revealed useful insights to overcome this lack, suggesting at least two further relevant perspectives which can help to strengthen, from a different side, the proposed distinction. The first one is clearly put forward by the Law itself, insofar as it emphasizes the role of the property as a central feature to address such distinction. Accordingly, the following analysis aims to assess whether different ownership allocation of RES facilities might affect the qualification between *sharing* and *trading* within CSC schemes.

P2P trading, as already outlined above, means “*the sale of renewable energy*” between prosumers and consumers (i.e., *peers*), who are enrolled into a well-known trade scheme whereby each participant can either sell

or buy renewable energy, switching from at least two market levels, depending on price signals variation. As a general rule, the power to sell requires, as such, the right to dispose of the property of goods, including renewable energies. To do so, it is quite obvious that in case of P2P trading the seller must be entitled to sell the self-produced renewable energy, either as owner of a RES installation or, otherwise, because expressly authorized on behalf of the owner [28,37]. In any case, it is not required that the seller always get the property of a production unit. Indeed, to the extent that it does not constitute the primary commercial or professional activity, the EU Law allows RSCs to pursue a broad range of undertakings (*generate; store; sell; share*) without being owners of RES installations, providing that the owner “*remains subject to the renewables self-consumer's instructions*” [45]. Therefore, the main feature which cannot be neglected in case of RSCs who want to *trade* renewable energy should be identified by looking at the control over RES installations, instead of the property. In this regard, the private law provides several contractual solutions (e.g., loan for use; usufruct; lease) to let RSCs able to maintain the power over facilities to sell renewable energy, without any concern related to the property of RES installations.

The latter statement leads to the following second outcome of this analysis: to *trade* renewable energy within a CSC scheme (e.g. through a P2P trading configuration) it is necessary that each prosumer maintains at least the control, instead of the property, over a RES installation. Consequently, citizens who collectively own or control a single RES installation cannot directly perform P2P trading each other, while, for what concerns the excess of electricity fed into the grid, as already said, they should be considered as a single grid user who manage a single (virtual) production unit. This conclusion is endorsed by the art. 21 par. 4 of the REDII, since it grants RSCs who operate in their premises to *jointly* undertake those activities listed on par. 2 for single RSCs and, on the internal side, “*to arrange sharing of renewable energy that is produced on their site or sites between themselves*”.

What about in case of *sharing*? Both REDII and IEMD contain various statements which expressly qualify in terms of *sharing* the exchanges of renewable electricity within those CSC schemes where members are committed to cooperate with shared facilities. The main example is undoubtedly the case of energy communities, including both Renewable energy communities and Citizen energy communities. The EU Law clearly establishes that to have *sharing* within ECs it is required that the renewable energy (or just electricity in case of CEC) must be produced by the production units owned by such legal entities (see the art. 22, par. 2 lett. b), of the REDII for RECs, and art. 16 par. 3 lett. e), of the IEMD for CECs). Indeed, literature review confirmed that this is the most widespread approach all over the Europe, seeing that “*two thirds of initiatives stated that their organization owns the RES installations of the initiative*” [4]. However, a strict interpretation of this requirement would probably undermine the development of several initiatives, constraining ECs to always get property rights on the entire asset of production, either excluding those contexts where each participant already owns a RES installation or, on the other hand, forcing citizen to put in place crow-founding initiatives as well as to bear financial burdens and risks to develop medium or large-scale installations.

To avoid such consequences, as precisely pointed out, “*it would be reasonable to explicitly include electricity produced by assets owned privately by community members as energy eligible for sharing in national transposition laws*” [17]; even though, at least from this perspective, it would become harder to distinguish *sharing* from *trading* through the analysis of property allocation. In fact, most of P2P trading configurations examined by the academic literature operate with distributed ownership of RES installations, so that matching and pricing mechanisms can be put in place, and, also, it can be easily assessed the economic benefit for individuals [37]. In this regard, a possible solution to fill the gap might be found by foregrounding the requirement of the control over installations, already examined for P2P trading. Hence, looking back at what argued on paragraph 3 with regard to rights and obligations as final or active customers the EU Law confers in case of *sharing* or *trading*,

when prosumers and consumers cooperate to share, instead of to trade, the excess of renewable energy produced on their premises, they should also be required to share those RES installations. To this extent, however, instead of property, it might be enough that participants collectively get the control over the whole production asset, switching from an individual power to a collective one.

Accordingly, it implies that in case of sharing each participant loses the right to individually manage the excess of self-produced renewable energy fed into the grid, even though such model might be concretely affected by different regulatory framework adopted. While in case of net-metering the electricity eligible to be traded does not take into account the whole production fed into the grid by each installation, as in case of trading, but, rather, only the offset between the overall production and consumption, for virtual-metering schemes all metering points are considered as a single point of exchange with the public grid. In the last-mentioned case, the amount of renewable energy entitled to be sold is the whole production fed into the grid [10]. In both cases, anyway, the electricity computed as “shared” cannot be autonomously managed by each participant anymore, because RES installations are no longer individually controlled but collectively owned. This might be the reason why the art. 16, par. 3 lett. e), of the IEMD specifies that in case of sharing “community members retaining their rights and obligations as final customers”, instead of *active customers*.

This approach turns out to be a useful expedient for the transposition of the EU directives, since it clarifies which features can be privileged to address the comparison between *sharing* and *trading* within CSC schemes, highlighting the legal boundaries. As a result, the adopted perspective also underlines the importance of accounting the ownership allocation of RES assets to assess which scheme mentioned by the EU Law is better suited for *sharing* or *trading* and, in addition, which private agreements would be considerable to promote such kinds of initiatives. Therefore, where the EU provisions expressly require participants to get shared control on the whole generation assets, P2P trading cannot operate among them, as it seems to be in case of RECs or jointly-acting RSCs. On contrary, when citizens undertake those activities listed by the EU Law for RSCs (*generate; store; sell*) without losing the individual control over RES installations P2P trading is always possible.

5. The contract law perspective

After having dealt with the analysis of RES facilities allocation, it might be useful to understand whether the contract law paves the way to further distinctions between *sharing* and *trading* within CSC schemes. To this extent, a second legally relevant perspective can be detected by focusing on the purposes which stand behind these configurations, looking into those contractual profiles which feature, more than others, the structure of such agreements. To do so, a prominent area of analysis lies on the contractual cause of those arrangements whereby CSC schemes participants are committed to distribute among them the value of the surplus of renewable energy fed into the grid. Such approach also represents the main area of investigation to carry out a value-oriented analysis between individualism-based and pluralism-based models.

Before covering this point, the following premise must be taken into consideration: to be legally relevant, each exchange of renewable energy, as for all goods and assets in general, needs to be supported by a contractual cause, regardless of any qualification in terms of *sharing* or *trading*. This principle is largely recognized in most of the civil law countries, even though some legal systems of the European Union do not recognize the concept of contractual cause (although they take account of the economic rationality of the agreement in other ways [46,47]). It aims to avoid wealth transfers which are not supported by an acceptable reason to legally justify the transfer itself. Accordingly, it should be kept in mind that energy transfers carried out by participants within a CSC scheme must fit a reason as well.

As already pointed out, P2P is essentially a common trade-scheme where participants act as “peers” to sell or to purchase renewable

energy. Such scheme is designed under a typical synallagma paradigm which reflects a “*do ut des*” formula, because each seller assumes the obligation to supply renewable energy while buyers, in turn, are committed to execute a payment for a given value, which is determined by a rolling price-mechanism. In this sense, with no account here for the whole P2P contractual structure, participants are involved in a one-to-one agreement which engages two parties with opposite interests (seller-buyer). From this perspective, the scope that inspires citizens in taking part in a P2P scheme is essentially a profit purpose, to the extent that sellers are expected to get the best remuneration for the excess of renewable energy fed into the grid, and, on the demand side, buyers wish to accept affordable and cheap bids. Claiming for a different nature of P2P trading would be in contrast with the Law, since it clearly states that P2P trading means “*the sale of renewable energy*” between prosumers and consumers. As rightly argued, «*In P2P energy trading market, each participant has its own objective to pursue. Most of the time, the objectives of different participants are conflicting*» [37]. For these reasons, P2P can be qualified as an individualism-based model, since the collective dimension of P2P, which certainly represents the background for its functioning, does not reveal further purposes than the profit one.

On the other hand, in case of *sharing* participants are similarly required to arrange a distribution strategy to spread among them the value of renewable energy exchanges. However, when the regulatory framework allows *sharing* of renewable energy through a virtual metering scheme, as for the case of Italy, the object of such contracts is the revenue of the overall production sold to the grid (including, if provided, incentives for the virtual compute of the shared energy). To this extent, parties are free to arrange several distribution patterns, regardless of any price mechanism or index, depending on the way they want to allocate this income. For instance, they might agree either to equally spread it to ease charged electricity costs, or, more frequently, to adopt a proportional criterion based on a “sharing rate” in order to push consumption during the peak of production.

Though, such agreements are often devised to balance different weight and roles undertaken by each participant, so that consumers may thus consider profitable to invest in RES installations rather than limiting their contribute to simply consume energy. In other words, participants who own production units are reasonably expected to benefit the most from a distribution strategy which rewards their financial effort to the overall production of renewable energy. This aspect is well explained by Minuto et al. [16], who offered an interesting overview from this outlook by comparing three *sharing* models within an EC to assess how different ownership structures are able to affect the distribution strategy and, consequently, the expected benefits for participants. Such different treatment appears reasonable and not discriminatory to the extent that it is proportional to the financial effort offered by each member. However, on the other side, those users who limit their contribution to consume renewable energy are similarly interested to adapt their consumption behaviors in a way that will maximize their economic benefits, according to a distribution plan that rewards such conducts, otherwise they will reasonably be reluctant to actively join such initiatives. As confirmed by the study provided by Hackbarth et al. [5], the most important factor that increase individuals’ willingness to be part of an EC is the perspective of an economic benefit, even though it can concretely differ depending on the role assumed within the configuration [5]. This conclusion holds true especially in case of low-income citizens who are unable to directly invest in powerplants, since their aim is only to participate as consumers in order to get benefits from their consumption rate.

In this sense, it would be hard to argue that the purpose which stands behind such *sharing* agreements is completely different than the one examined for P2P trading. Citizens who either own RES installations or provide financial effort might decide to act as individual RSCs if more convenient than cooperating with other people in community initiatives. For this reason, the contractual cause which normally assists such *sharing* agreements seems to closely comply with a “*do ut des*” formula

rather than a “*gratuitus*” promise, given that each participant is always interested to get a mutual consideration from being part of these initiatives (i.e. an economic benefit, even in terms of money savings) [5].

The comparison tackled from this perspective reveals an interesting feature of such *sharing* agreements, highlighting that purposes are not so different if compared to those aforementioned for P2P trading. Both, in fact, are supported by a similar contractual cause because are essentially designed to spread the value of the exchanges among participants, by taking into account each contribution to the overall production and consumption [18]. Therefore, this assessment might be conclude that both *sharing* and *trading* agreements reflect similar contractual baselines, which are essentially designed on individualism pathways, assisted by mutual consideration. However, such approach would undoubtedly prevent further spaces to target the pluralistic view instilled by the EU Law, as well as to justify the social and environmental commitments that citizens are required to pursue, as a part of the deal, in case of ECs.

Rather, it is the analysis of the considerable contractual latitude which feature *sharing* agreements that opens for a different conclusion. As previously argued, in case of *sharing* participants may customize the contents of such arrangements by referring to a broad range of solutions, as long as they can spread the incomes in multiple ways. Instead of P2P trading, where parties have no chance to exit from the abovementioned legal scheme without losing their rights and obligations as sellers or buyers, participants of *sharing* initiatives might agree to tailor a set of distribution rules to allocate revenues, e.g., on solidarity goals, as well as on environmental or social actions, rather than on a profit-basis. Such freedom of contract is what mainly features *sharing* agreements, affecting the contractual cause in a way that enables clear distinctions between, on the one hand, profit purposes and the mutual consideration, which are typical elements of P2P trading, from, on the other hand, those which stands behind community initiatives. This does not mean that P2P trading is not assisted by the freedom of contract principle. On contrary, parties of P2P trading scheme have an appreciable level of contractual freedom, since they can suddenly and freely switch from suppliers to prosumers and vice-versa to get renewable energy at the lowest price. However, this feature does not impact the contractual cause, which still remain the same. After all, when *sharing* is expressly mentioned by the EU Directives as a possible way to manage renewable energy within a CSC scheme, as for the case of ECs, the Law itself points out that the *primary* purpose is to provide “*environmental, economic or social community benefits [...] rather than financial profits*” (see art. 2 par. 2 n. 16 lett. c) of REDII, and art. 2 par. 1 n. 11 lett. b) of IEMD).

Therefore, the contract law perspective turns out to be a relevant means to shed light on further distinctions between *sharing* and *trading* within CSC schemes. It helps to investigate the core of these configurations, addressing the concrete purposes and factors which drive citizens in taking part in such schemes. At the same time, this approach provides arguments to highlight which CSC schemes would be eligible to be recognized as individualism-based or pluralism-based models, insofar as it made clearer the distinction between profit-oriented schemes and those in which the freedom of contract principle opens to different distribution strategies, reflecting an inclusive and social view of the energy transition.

In both cases (*sharing* and *trading*) participants are normally driven by the same purpose, which is to get a mutual benefit proportionally to the respective contribution they provide. Nevertheless, while P2P trading is constrained into a typical legal trade-scheme which cannot admit further interpretation, in case of *sharing* agreements parties can conversely opt for a variety of distribution patterns which turns such typical contractual cause into a mixed one, conferring a different footprint. Accordingly, the contractual scheme which fits, more than others, such purposes can be found by looking at those multilateral contracts characterized by a common-purpose and mutuality. These features, indeed, facilitate the establishment of a common understanding towards the achievement of common goals, since all competing interests can be easily included within the binding structure, leading to further activities

which set aside from the individual sphere of interest [48,49].

6. Discussion and conclusion

This study raises several questions that will need to be addressed in the coming years. These questions are closely related to the implications of EU policies concerning the relationship between EU citizens and the ongoing energy transition process. Nonetheless, the proposed research under the private law perspective would be helpful and consistent with the purpose of providing affordable and reliable instruments to EU citizens so they can play an active role in the electricity market. In the meantime, it aims to be a support for the EU legislator for the implementation of a framework which enhance the role of citizens as the centre of the energy transition. As correctly argued “*without recognizing the inequality of opportunities for different citizens group to participate, citizen participation fails to deliver its democratic and empowering promise and risks becoming empty rhetoric*” [7].

However, the arguments discussed above suggest that one final effort can be made to combine all the findings from this study in order to determine which of the examined CSC schemes are suitable for *sharing* or *trading* electricity. Indeed, the analysis carried out under the property law has revealed that *sharing* is only possible when production units are collectively controlled by all participants, so that they are essentially considered as a single virtual metering point of the grid [17]. *Trading*, on contrary, requires that each seller must individually maintain at least the control over that RES installation from which the electricity eligible to be sold comes from. On the other hand, the contract law perspective has highlighted that such differences tend to vanish when it is considered the purpose which stands behind people’s assent and expectation in taking part of such initiatives. Nevertheless, this study has also underlined that the structure of *sharing* agreements is undoubtedly more open and well suited to temper the “*do ut des*” formula, which, conversely, is the only - typical - one in case of *trading* schemes.

Following-up the above mentioned outcomes, it can be argued that CECs let participants free to undertake both *sharing* or *trading* patterns. Whenever citizens are willing to share their production surplus with no account for profits as their primary intention, as for the case of RECs or jointly-acting RSC, they are required to collectively own, or, at least, to control, the whole production asset, so that economic benefits can be spread among them, according to a distribution strategy which can be designed in several manners. On the opposite, they can opt to run a virtual auction market, with the support of a platform provider, where the same amount of electricity is sold (instead of shared) among them. In the latter case, CECs can be operated as an “umbrella” organization to collectively manage the distribution network, assuming DSO’ rights and obligations, without losing the individual control of RES facilities. To the extent that such legal entity can contribute to ease responsibilities for grid imbalances caused by peers’ exchanges, as well as to directly offer digital services to optimize energy flows, CECs will not be required to own or to develop any RES installation. In this sense, their role can be limited to handle that distribution grid where a P2P platform is placed to virtually track energy flows in view of reliable and checked exchanges.

In case of RECs, as mentioned by the REDII, the alternative between *sharing* and *trading* of (virtually) self-consumed electricity becomes much harder to argue. According to the REDII provisions, RECs are entitled to pursue all activities listed by the art. 22 par. 2 (a, b, c), other than those mentioned by the par. 4 lett. b) (“*supply energy or provide aggregation or other commercial energy services*”), including the possibility to operate as a DSO, without being subject to any discriminatory treatment. Consequently, as highlighted above for CECs, RECs’ participants should not be prevented to *trade* among them the electricity surplus, to the extent that those *commercial energy services* comprise, e.g., P2P trading platform management services. In such cases, it is now clear that REC members who are entitled to place bids, i.e. sellers, should individually maintain (at least) the control over RES installations, which, conversely, couldn’t belong to the legal entity at all (as for the case of

sharing).

However, the legal framework established for RECs suggests that such entities must always own, or at least control, one or more RES units. This conclusion is strongly supported by those rules which tie the governance and control of a REC to those participants “*that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity*” [50]. A contrario, this would mean that a REC which does not own any *renewable energy project* couldn’t comply with those REDII requirements which have fixed a certain decision-making structure of the legal entity. In other words, while CECs are not required to necessarily own production unit whenever they already own and manage the distribution grid, RECs should always own RES units as a mandatory requirement to fulfill the last-mentioned governance condition; otherwise, it couldn’t be possible to detect who undertake the control within the community. Such feature is not similarly established for CECs, since the governance side is not linked to any proximity criterion [51].

So, how to allow P2P trading within a REC? There are undoubtedly several reasons to argue that RECs are well suited to undertake P2P trading, especially when a broad interpretation of the terms “*owned and developed by that legal entity*” would grant participants to individually retain the control over RES facilities, so that they do not lose the right to dispose of their energy surplus. Nonetheless, there are certainly more arguments to support a different thesis which consider RECs, as well as jointly-acting RSCs, a kind of configuration designed to be driven not only by profit or individual purposes, as it clearly seems to be in case of P2P trading, but, rather, a pathway toward an inclusive energy democracy. In light of this, a different interpretation would require RECs to always maintain the control over RES installations as a necessary feature to manage the electricity produced in such a way that sharing agreements can be executed by taking into account all competing interests, letting participants free to transparently design the distribution strategy they want.

Furthermore, there is another reason which is noteworthy due to its relevance for the implementation of a national regulatory framework that accurately takes into account such distinction. As already pointed out above (par. 3), whenever citizens are committed to collectively produce and consume electricity through shared facilities they are mostly considered as a single virtual point of exchange with the grid. In such cases, the electricity eligible to be sold becomes the offset between internal production and consumption. This holds true to the extent that two sides are basically considered: internal and external. The former comprises matching on a real-time or near-real-time basis the overall production and consumption in order to quantify the amount of energy that is shared among members (i.e., self-consumed); the latter, conversely, invests the relation between the whole configuration and the rest of the grid, concerning only the offset between the internal production and consumption (i.e., the overall surplus of production). Such scheme is strongly supported by those REDII provisions that consider RECs, as well as jointly-acting RSCs, as a single self-consumer when they act in front of the whole grid (“*produce, consume, store and sell renewable energy*”; “*access all suitable energy markets*”), and, on the other hand - on the internal side -, to perform sharing within the grid perimeter where the REC is based (“*share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community*”).

As a result, in case of P2P trading, in which each single point of connection should be able to autonomously interact with the grid, the scheme outlined above for RECs seems to vanish. Indeed, whenever P2P trading is put in place: i) the aforementioned duality (internal/external) always invests the surplus of production, which can be either (internally) placed for bids or (externally) sold to the whole grid by each seller, and ii) the option between selling on the internal or the external side does not change the legal nature of the exchange, which still remains selling of electricity. Such differences have relevant consequences for what concerns other domains of law (the main, undoubtedly, is the tax law), and intercepts several crucial queries regarding the welfare-

enhancing capacity of the examined CSC schemes.

Such conclusion seems to be confirmed by looking at the EU Commission *Proposal for an amending Regulation to improve the Union’s electricity market design* of March 14, 2023 [52], as it was recently amended by the Council of the European Union on 16 June 2023 [53]. The purpose of boosting citizens empowerment to protect them from price volatility has led to a set of measures which have relevant consequences for the proposed discussion on the difference between *sharing* and *trading*. Although the intervention of the EU Commission leaves open several questions which need to be addressed once this proposal will be approved by the European Parliament [54], what might be highlighted here is the strong connection between *sharing* and *self-consumption* of renewable energy, which is clearly put forward by the new art. 2, par. 1, no. 10a), of the IEMD [55]. Moreover, the new article 15a of the IEMD ensures the right to have *netted* that shared electricity from the total metered consumption.

The proposed amendments, especially after the EU Council revision, are consistent with the thesis explained here, because clearly intend *sharing* as an activity aimed to satisfy the energy demand of a group of citizens who want to act together to curtail energy costs by self-consuming electricity, rather than individually monetize the surplus produced by some of them through a P2P trading scheme. Indeed, it is quite evident that *sharing* is necessarily far from a P2P trading scheme due to the absence of any obligation to pay for the energy supplied (i.e. *self-consumed*), otherwise there would not be any tangible difference from the previous market scenario, which is basically built on the seller-buyer binomial.

The proposed reading invests, more generally, the different impact that collective self-consumption may have on, both, the electricity market and its welfare-enhancing function for the society as a whole. Although P2P trading unquestionably requires a plurality of grid users - that’s why this study classified it as a CSC scheme -, in the meantime it reflects an individual approach to the grid and the market, to the extent that decisions are essentially independently driven by price signals. On contrary, those configurations that are inherently designed to collectively exercise rights and duties laid down by the EU framework for renewables self-consumption, as for the case of ECs and jointly-acting RSC, should be intended as means for citizens to assume - *together* - an active role in the electricity market to mutually benefit from its new design through a pluralistic and inclusive view, and, in the end, to reach the local energy autonomy.

Credit author statement

All activities related to the preparation of this article were made by the sole author. No one else has collaborated.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

All scientific literature used is referred through shared links in the references section

Acknowledgements

The author would like to thank Prof. Marisa Meli and Prof. Lucila de Almeida for insightful discussion on the topics covered by this work and the support provided in reviewing the article. Many thanks goes also to anonymous referees for helping the author in providing additional insights to improve and complete the work.

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