



Original research article

Do renewable energy communities deliver energy justice? Exploring insights from 71 European cases



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ARTICLE INFO

Keywords:

Energy communities
Energy justice
Energy poverty
EU policy

ABSTRACT

A growing energy justice literature underlines that complex energy injustices in energy transition disproportionately affect vulnerable and energy-poor households. Literature and policies discuss renewable energy communities' (RECs) potential to enable citizen participation in energy transition and shape a just transition. Low-income and energy-poor households could benefit from granting access to affordable energy tariffs and energy efficiency measures when participating in RECs. Recent EU legislation highlights RECs' social role in energy poverty alleviation and stipulates the participation of all social groups in RECs, especially those groups that are underrepresented under RECs' members. In this light, the energy justice framework is increasingly applied to analyse RECs' social contributions in different countries. Still, empirical evidence of RECs' capacity to include underrepresented and vulnerable groups and mitigate energy poverty as a particular form of energy justice remains scarce. Drawing on data collected among 71 European RECs, our exploratory research investigates how RECs engage in this social role by improving participatory procedures to enable vulnerable groups' participation and by distributing affordable energy and energy efficiency to vulnerable households. Using the energy justice framework, we explore how RECs resonate with the three energy justice tenets (distributive, recognitional and procedural) by addressing underrepresented groups and energy poverty.

1. Introduction

Over the last two decades, renewable energy communities (RECs) have become critical players driving a citizen-led European energy transition [1–3]. Organised collectively, RECs engage with local households, enable local citizen participation [4] and raise social acceptance for energy transition [5–8]. Pooling their members' resources, they develop local renewable energy projects [4,9–11]. In doing so, energy communities contribute to energy decentralisation [11], and by enabling citizen participation, they contribute to energy democratisation [12,13]. Furthermore, by investing in renewable energy projects locally, they increase awareness of energy transition and create value locally by improving income streams, developing skills, building capacity and reducing CO₂ emissions [9,14–17]. RECs may also facilitate community regeneration and autonomy [18].

Concerning equity and justice, RECs are increasingly discussed as taking a central role in overcoming energy-related injustices with a democratic, equity enhancing approach [19–21]. In Europe, up to 82 million households struggle to pay their energy bills [22]. Threatened by energy poverty, energy vulnerable groups [23] are often excluded from shaping energy transition [22]. In theory, RECs can engage with vulnerable groups and address energy poverty, e.g. by providing lower tariffs and increased energy efficiency [24]. The European legislator takes up these elements, highlights RECs' social role in energy transition and stipulates "opportunities for renewable energy communities to advance energy efficiency at household level and (...) fight energy poverty" in the recast of the renewable energy directive (RED II) [25]. RED II further links an enabling framework "to promote and facilitate the development of renewable energy communities" [25] with the obligation to ensure the participation of all "consumers, including those

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in low-income or vulnerable households” [25].

However, RED II refrains from providing details on how to achieve RECs’ social role in practice. The national energy and climate plans (NECPs) should entail each member-state’s approach to transposing RED II. Until now, only the NECPs of Portugal, Spain, Italy and Greece link RECs with energy poverty alleviation¹. Further, the extent to which above raised beneficial outcomes and RECs’ social role materialise beyond good practice examples is debatable [19,26,27]. Some scholars criticise a ‘romanticised’ narrative of energy communities [28,29] which may be hiding shortcomings, e.g. how local communities benefit [30,31]. Especially vulnerable communities face challenges to engage in, benefit from and develop their own local renewable energy production [32–36]. Currently, only some social groups have the means (e.g. economic capital, time and know-how) to participate in RECs and benefit (e.g. through enabling frameworks) from the transition to clean energy [37]. In Germany, for instance, REC members are typically middle-aged men with high income and a technical, higher education background [38]. Other groups, predominantly low-income and (energy) vulnerable groups [23], remain underrepresented [39].

In this light, the energy justice framework [40,41] is increasingly applied to analyse RECs social contributions in different countries [42–45]. Still, empirical evidence of RECs capacity to include underrepresented and vulnerable groups and mitigate energy poverty as a particular form of energy justice [46–48] remains scarce. Drawing on data collected among 71 European RECs, our exploratory research investigates how RECs engage in this social role.

We apply the energy justice framework [40] as our conceptual and analytical framework [41] to study our main research questions: Do RECs in our sample aim to facilitate vulnerable groups’ participation and energy poverty alleviation? If yes, how do they achieve their aim? If no, what challenges do RECs face? To answer our research questions, we apply a mixed-method approach. First, we conducted nine exploratory interviews with executive members of RECs to understand their perspectives on our research questions. Through the interviews, we got a feeling for the language and terminology used by RECs, especially for their understanding of ‘underrepresented groups’ and ‘energy poverty’. Second, we applied the terminology used by RECs to design an online survey. Finally, in an explorative approach, we distributed the survey mainly in Germany, France, and the Netherlands and beyond using the authors’ professional networks and the Engager² network to share the survey. Given the plurality of REC schemes [4,19,26] and to avoid a definition debate, we define ‘REC’ according to RED II. As a result, RECs in this paper are defined as legal entities, “(a) 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 entity³; (b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its

¹ Based on [22] we conducted a keyword search for all final NECPs available in English as of 17th of September 2020. Keywords used include (renewable) energy community, energy poverty, enabling framework and vulnerability. We searched the relevant sections in all NECPs for any thematic connection between energy communities, enabling regulatory conditions and energy communities’ role in mitigating energy poverty.

² Engager is a research network funded via the European COST scheme. It is aimed at developing and strengthening an international community of researchers and practitioners focused on combating energy poverty.

³ RED II does not specify these criteria and leaves the details to be defined by the national legislator. In general, *open and voluntary participation* means that all local citizens - citizens in the REC’s proximity can participate. The same applies to *effective control*. Usually, effective control prevents one member from holding more than 49 per cent of shares [49]. REScoop.eu and ClientEarth provide details on these criteria in their transposition guidance [50].

shareholders or members or for the local areas where it operates, rather than financial profits” [25]. For example, reducing CO2 emissions with increased energy efficiency is an environmental benefit; generating dividends for members an economic benefit and promoting energy democracy and investing in energy poverty mitigation a social benefit [50]. In the following, we mainly explore RECs’ social role and thus how RECs in our sample provide social benefits to different social groups.

Following this introduction, the next section introduces our conceptual approach. The methodological section 3 describes our research approach and data collection. Section 4 summarises the survey’s results. In section 5, we apply the results to the energy justice framework and our research questions. Finally, section 6 concludes and points out a need for further research.

2. Conceptual approach

This section introduces the conceptual framework of this paper, linking the energy poverty debate with the energy justice theoretical framework. It describes our approach to operationalise the energy justice framework to explore how RECs fulfil the above outlined social role. Based on our research questions, we review current literature to (i) identify different elements of the three energy justice tenets (distributive, recognitional and procedural justice) and (ii) describe indicators used to assess how energy communities contribute to each tenet and with that to their social role.

2.1. Energy poverty and RECs

In this paper, we refer to Bouzarovski and Petrova’s [51] definition of energy poverty as a household’s propensity to be unable “to attain a socially and materially necessitated level of domestic energy service”. Energy poverty research investigates unfair access to essential energy services and addresses three different categories of injustices: inequalities in income impacting energy affordability; in housing accessibility, quality and affordability driving energy needs with adverse effects on comfort and health; and in energy policy (e.g. energy tariffs, feed-in tariffs, their financing and consumer protection regulations) increasing energy vulnerabilities [52]. We apply this understanding to explain energy poverty in our survey. Furthermore, energy poverty is increasingly embedded in climate and energy transition policies, revealing new inequalities in distributing the costs and benefits of energy transition [37,53]. In this light, deploying renewable energy generates new burdens on energy bills, disproportionately affecting vulnerable households, as investigated in Germany [54,55].

Thus, vulnerable households struggle to afford a sufficient energy service level and have no choice or voice concerning energy decisions, a circumstance referring both to a distributional and a procedural injustice [40]. Such injustices need to be recognised and addressed to realise a fair and sustainable energy transition. However, most European countries do not recognise energy poverty as an energy issue but consider it as income or social inequality [56]. Consequently, national energy policymakers are often unaware of the existence and scope of energy poverty and the existing inequalities in energy access [57].

Participation in a REC can entail lower energy tariffs and benefits from dividends and services such as access to clean electricity or heating and energy savings or efficiency advice. Thus, in combination with an enabling framework (RED II) (which may include simplified administrative and regulatory requirements, lower levies and taxes), participation in RECs may reduce the costs for energy consumption and provide an additional source of income [24]. Moreover, as every kWh not self-consumed is one potentially sold, it may positively impact energy behaviour and incentivises energy efficiency⁴. Empowering vulnerable

⁴ Roth et al. [58] explore how different forms of energy prosumption impact energy consumption behaviour.

groups to participate could thus potentially contribute to mitigating energy poverty.

2.2. Energy justice and RECs

Sovacool et al. [59] define energy justice “as a global energy system that fairly distributes both the benefits and burdens of energy services, and one that contributes to more representative and inclusive energy decision-making”. Energy justice is a critical framework for identifying and analysing injustices in the energy system related to aspects such as class, race, ethnicity, age, gender or spatial and economic inequalities [36,40,41,57,60–63]. Evaluating where injustices emerge, the energy justice framework identifies social groups affected by such injustices. It further evaluates whether processes exist to reveal and reduce identified inequities [40]. Sovacool & Dworking [41] distinguish three functions of the energy justice framework: as a conceptual, analytical and decision-making framework to make informed energy choices. This paper focuses on the conceptual and analytical function in operationalising and applying the energy justice framework to analyse RECs’ above-outlined social role. In doing so, we apply the three energy justice tenets, distributional, procedural and recognitional justice [40,48] to the REC context. We acknowledge that although the three energy justice tenets differ, there remains a degree of co-dependency and mutual reinforcement between them.

Procedural justice refers to equitable procedures that allow all local stakeholders to engage and participate in the energy transition in a non-discriminatory and inclusive way [40]. We apply this understanding to the procedures [48,64] of RECs in our sample linked to RECs’ social role. We assess the extent to which these procedures (i) enable participation of different groups and (ii) energy poverty alleviation.

RECs have the (theoretical) potential to empower (energy vulnerable) individuals to participate [24]. However, barriers to inclusive participation exist. RECs rely on volunteering [65,66] with limited access to borrowing capital [67]. Further, resources are often bound to the priority aim of contributing to the clean energy transition or yield generation [39,68]. Thus, RECs’ business model, embedded in a competitive energy market, may limit their ability to open up to broader social groups. Further, motivations to set up and join a REC differ [69]. In Germany, the data available on energy communities’ motivations and their members’ motivation to join indicate a vast diversity [68]. In general, smaller energy communities tend to be motivated to contribute to local energy transition and environmental protection. The larger the energy community gets in terms of members or investment volume, the more financial motives prevail over social inclusion.

Linked to the organisational purpose is the role of energy communities’ initiators/founders. Often steering decision-making, they significantly shape the organisational culture and introduce (informal) rules, norms, and beliefs. The organisational culture, in turn, functions as a gatekeeper and often determines who becomes a member [39]. Thus, decision-makers’ biases [44] may prevent the involvement of social groups not perceived as sharing the same set of values (e.g. contributing to energy transition) or possessing sufficient financial means, as observed in Germany [39]. Neglecting their social role in addressing those affected by energy poverty or underrepresented groups represents another obstacle preventing RECs from engaging in this field.

On the other hand, there are also barriers to participation on the side of vulnerable households (however less researched). They often lack or think they lack social and economic capital, e.g. in the form of access to information, knowledge about energy communities, awareness of their potential role as members in RECs, or financial resources to invest [24,70–72]. Such a lack of knowledge is often the result of limited access to local social networks or individual initiators involved in a local REC [39,73,74]. Often experiencing prolonged financial scarcity, vulnerable households are likely to refrain from taking the financial risks [75–77] linked to investing in energy communities [78]. Necessary available time for voluntarism linked to membership is a further requirement,

restricting participation [65]. In general, volunteering rates depend on education and other social factors such as peer groups [79]. Data also suggests that low income or unemployment inhibit volunteering at least for men [80]. Also, vulnerable households face other priority concerns than energy and struggle with their daily lives [75,81,82]. Thus they may refrain from envisioning their potential active involvement in the energy system. In short, vulnerable households face a set of economic, social and individual participatory prerequisites. As a result, they are often excluded from participating or exclude themselves from participating.

As a consequence, access to information and knowledge about RECs [43,83,84] and financial capital [70,72], as well as adequate processes of decision making [64] enhance the possibility to participate. Furthermore, decision-makers should overcome biases and prejudices to support the participation of vulnerable groups, thus better address procedural justice [39,44,45]. Table 1 summarises the indicators used to assess procedural justice: Targeted information campaigns and initiatives to open up membership, e.g. through low-cost participation (low share prices or membership fees).

Distributional justice investigates where energy injustices emerge, both in production and consumption [40]. In this light, energy poverty research addresses distributional burdens of increases in energy prices [85] or the distribution of renewable energy’s costs and benefits [37]. We apply distributional justice to investigate the distribution of (material) outcomes (membership diversity, lower costs, energy efficiency) to different target groups as a result of RECs’ procedures [40,41,43,45,48]. RECs can contribute to distributional energy justice by granting access to their activities and services to groups that usually do not benefit. We, therefore, use the following indicators to assess distributional energy justice: member diversity, activities dedicated to vulnerable or under-represented groups, and the provision of lower tariffs or share prices and other services (e.g. energy efficiency advice, energy savings).

Recognitional justice inquires which sections of society and their needs are ignored or misrepresented [40,48,86]. Recognitional justice focuses on understanding differences and accommodating particular needs [48]. We follow Walker and Day [48], who apply recognitional justice to the energy poverty discourse and use recognition to highlight the particular needs of social groups [87], in our survey, underrepresented and (energy) vulnerable groups. In this light, energy poverty research highlights the need to acknowledge differences in domestic

Table 1
Elements and indicators of energy justice applied to RECs.

Justice Tenet	Elements	Indicators
Procedural Justice	Access to information [43,65,83,84] Access to membership [24] Access to decision making [64] Absence of bias [39,44] Representation of stakeholders [40]	Overcoming barriers for participation: - Reduced membership fees - Lower share prices for vulnerable groups - Targeted information & engagement activities
Distributional Justice	Access to outcomes in the form of benefits & services [41,45]	Member diversity Services offered: - Energy efficiency services targeted at vulnerable groups - Lower energy tariffs for vulnerable groups
Recognitional Justice	Awareness of energy vulnerability & energy poverty & engagement of vulnerable energy consumers [52,88]	Level of knowledge about: - Energy vulnerability & poverty, the preferences, needs & living situation of vulnerable & energy-poor households Engagement with energy vulnerable & poor households Addressing energy poverty in the organisational statutes

Source: Authors.

energy needs and the circumstances intersections of energy vulnerabilities create, and how these exclude certain social groups [52]. Scarcity, in general, changes the way households think and make (energy) choices [75,82]. Understanding and recognising the living situation created by energy vulnerability and poverty and of respective injustices related to energy access and affordability is the basis for a successful address of vulnerable and underrepresented groups [88].

RECs are discussed as democratically legitimate agents representing the voice of a cross-section of energy consumers [2,12,20,21,25,89]. There is, however, a danger of a normative ‘localist trap’ where energy communities are considered just merely because they are local [32]. With a return to the local scale for enhanced policy effectiveness visible in the demand for energy democracy to drive a just transition and to re-legitimise the underlying political process, matters of justice, e.g. providing a voice to all consumers, need to be considered as well. While local communities are well placed to serve local needs and together with ‘critical citizens’ [90] can be a riposte to globalisation, monopolistic economy and state retrenchment [32], it is essential not to neglect social inequality and its consequences. For instance, the limited recognition of groups poorly positioned to take advantage of local approaches is mirrored by the prior discussed participatory prerequisites: Some are more likely to be recognised and participate in energy communities than others. In this light, we apply the concept of recognitional justice to understand whether existing REC procedures recognise these specific living conditions.

In doing so, we use the following indicators to assess recognitional energy justice: the level of knowledge about energy vulnerability and poverty, about divergent preferences, needs and living situations of vulnerable and energy-poor households in comparison to average-income households and how they affect participation; the engagement with energy vulnerable and poor households; and addressing of energy poverty in the organisational statutes.

Table 1 summarises the identified dimensions of the three energy justice tenets and respective indicators.

3. Methodology

While this paper draws upon the energy justice framework to shed light on the extent to which RECs fulfil a social role and mitigate energy poverty, the empirical data used to support this insight is derived from two approaches, semi-structured expert interviews ($n = 9$) [91] and an online survey ($n = 71$). This data was collected over six months, from mid-2020 to the end of 2020. Expert interviews were used to gain familiarity with RECs’ perspective and challenges to include underrepresented groups and mitigate energy poverty. Through the interviews, we gained more profound insights into how RECs engage with different energy justice elements and understand their social role in addressing underrepresented groups and energy poverty. The interviews further helped us understand the language and terminology RECs use, particularly RECs’ understanding of ‘underrepresented groups’ and ‘energy poverty’. Finally, we transcribed essential passages of the interviews and applied content analysis to derive the below-mentioned categories of underrepresented groups.

To reach more RECs, we designed an online survey to collect additional data to answer our research questions. We used the insights gained from the interviews to structure the online survey. Our research aims to operationalise energy justice tenets while acknowledging that these three tenets are mutually reinforcing and interrelated. In doing so, we apply an explorative approach to reach as many European RECs as possible without claiming to have gained a country representative sample. Due to the author’s origin, professional network and information access, most replies came from Germany, France, and the Netherlands. The survey was available in four languages: English, French, German and Dutch.

In Germany, depending on the definition, the number of energy cooperatives varies from 2013 to 2017 between 889 and 1,024 [92–95]. To

identify energy communities, most of which cooperatives, we used three sources listing existing energy communities in Germany: Bürgerenergie Jena, Energieagentur NRW and Netzwerk Energiewende jetzt e.V. We identified 1001 energy communities in Germany of which we successfully contact 727 via email. The high numbers of RECs in Germany [2] explain its overrepresentation in our sample.

We applied a snowball technique to capture energy communities beyond our German sample. In France, according to the Énergie Partagée Association, 240 energy communities exist [96]. The survey was sent out to the French network of the regional energy agencies and two large French energy cooperatives to participate and share the survey among their networks. In the Netherlands, according to the Local Energy Monitor HierOpgewekt, 484 energy communities exist [96]. We shared the survey on LinkedIn and Twitter with 1079 and 368 connections to the energy field, generating 2157 views. We further shared the survey within the University of Twente network of energy communities and all ENGAGER members, representing all European countries. At ENGAGER, experts in energy and energy poverty come together with extensive networks in the energy field. This approach explains the additional cases from Belgium, Portugal, Ireland and Turkey in our sample.

The survey questionnaire contains 20 questions. It was designed and programmed by us to be answered online and covers four categories, each corresponding to a different information need.

The main categories:

1. Filter questions (e.g., Are you a REC?, legal form, the purpose of the organisation);
2. Underrepresented groups (e.g. Do you address underrepresented groups and how);
3. Energy poverty (e.g., Do you address energy poverty and how);
4. Your Organisation (e.g., location, number and gender of members);

We ran a pre-test distributing the survey to 10 individuals in the energy research community. We cleaned, tested and analysed the data using the computational programme SPSS to structure and display the data. We applied content analysis to both the interviews and open text replies in our survey.

4. Empirical results

The following section presents the results of the online survey. We structure the results according to the surveys’ initial design.

4.1. Description of the final data sample

We received a total of 123 replies, of which 71 RECs completed the questionnaire. 66 cases indicate to be a REC, and 61 comply with the definition of a REC as stated in RED II, with proximity being the exclusionary criterion. 82% of the cases are cooperatives. **Table 2** provides an overview of the final data sample.

The primary purpose of the energy communities in our sample is to promote clean energy, followed by regional value creation and

Table 2
Data sample overview and RECs.

	DE	FR	NL	BE	PT	IRL	TUR	Total
Number of replies	51	10	6	1	1	1	1	71
Number of self-declared RECs*	49	9	6	1	1	1	1	66
Number of RECs according to RED II**	43	10	6	1	0	0	1	61

Source: Authors.

*These RECs state that they meet the definition of a REC.

**These RECs meet all criteria of the official RED II definition. To determine effective control, we asked whether members are involved in all major decision-making processes. Further, we apply a radius of less than 100 km as the proximity criterion.

controlling the energy supply. Thus, RECs' primary purpose is to promote renewable energy, and some respondents do not feel responsible for extending their energy-related activities to what is perceived by them as social welfare. [Table 3](#) lists the primary purpose of the RECs in our sample.

4.2. Member diversity and decision making

Out of 71 cases, 49 cases (69%) indicate the total number of members with a median of 185 members. 42 cases (59%) provide an estimate on the percentage of female members with a median of 30 female members, that is 16,2 %. When assessing the survey results through a gender lens, we observe a gender gap. In Germany, we were able to identify 1001 energy communities and collected information on the gender composition of the board for 696 energy communities. Here 580 boards are only occupied by men (83,3%), 101 occupied by both men and at least one woman (14,5%) and 15 are only occupied by women (2,1%).

For 'control in the organisation', a majority of 68 cases (96%) report that members/shareholders control the organisation, 6 (8%) cases report that this is not the case. The general assembly is reported as the main instrument for decision making applying the one-member-one-vote rule.

4.3. Underrepresented groups and energy poverty

In our sample, 30 cases (42%) report addressing underrepresented groups through their activities, 41 cases (58%) report not addressing underrepresented groups. [Table 4](#) lists the main organisational activities of RECs in our sample and distinguishes between RECs offering these activities exclusively to members and underrepresented groups.

Concerning energy poverty, 13 cases (18%) report addressing energy poverty, 54 cases (76%) do not address energy poverty, and 4 cases (6%) did not respond to the question.

[Table 5](#) provides an overview of underrepresented groups addressed by energy communities in our sample.

In the survey, we distinguish between addressing underrepresented groups through (i) general engagement activities targeting all citizens and (ii) specific engagement activities such as information and engagement activities targeting underrepresented groups.

Of the 30 cases (42%) that report addressing underrepresented groups, 16 cases (22,5%) report addressing underrepresented groups through general engagement activities. 10 cases (14%) indicate that participation is open for all with no distinction between different groups and their diverging needs. Here addressing underrepresented groups is perceived as being achieved by allowing everyone to participate. One case reports providing solar energy to vulnerable households without them having to contribute financially.

Six cases (8%) report offering specific engagement activities such as

Table 3
Primary Purpose of energy communities in our survey.

Type of Purpose	N	Per cent of cases
Promotion of Renewable Energies	60	85
Promotion of regional value creation	33	46
Dividend payments for members	17	24
Energy supply in your own hands	33	46
Provision of social benefits	10	14
Other, please specify*	10	14
None of the above	1	1,4

Source: Authors.

*We reviewed the 'other replies' and, if applicable, added them to the above categories.

Regarding the activities of RECs in our sample, producing renewable electricity is mentioned as the primary activity. In addition, 40 % offer these activities exclusively to members and 10 % explicitly (also) to underrepresented groups. [Table 4](#) provides an overview of the types of activities in our sample.

information material and events targeting underrepresented groups. In this regard, one case stresses the importance of explicit communication channels: "Often, we can only communicate the benefits for disadvantaged households in a personal conversation." (open text reply). Examples of engagement activities include the setup of cafes to inform local households about energy saving and the possibilities to switch providers. Nine cases also state having separate cooperation projects with other local partners addressing vulnerable households and energy poverty. Examples include collaboration with local charity organisations and housing providers and other local cooperatives, schools, social housing organisations and municipalities.

Lower energy tariffs compared to the market price, energy efficiency and lower share prices or membership fees are particularly important for addressing underrepresented, vulnerable and energy-poor groups. In this respect, 25 cases (35%) offer lower tariffs compared to market prices; 29 cases (41%) offer at least one form of energy efficiency measures and 19 cases (27%) offer lower share prices or membership fees. 5 cases indicate low share prices as a way to allow and facilitate the participation of underrepresented groups. Here 50 Euro as a share price is both perceived as facilitating and restricting the participation of underrepresented groups. Respondents further indicate 50, 250, 500 and 3000 Euro respectively as a share price low enough to facilitate underrepresented and vulnerable groups' participation. [Table 6](#) summarises these services offered by RECs in our sample and distinguishes between cases that report addressing underrepresented groups and those that do not.

To shed light on the reasons for not addressing vulnerable groups or energy poverty, we provided different reply options combined with open text fields in the survey. Concerning reasons for not addressing underrepresented groups and energy poverty, a majority states that these topics have not been discussed yet and underlines a need to focus on core business activities (see [Tables 7 and 8](#)). In the open text replies, RECs indicate a lack of resources, mainly a lack of human resources and financial means and time to address underrepresented groups and energy poverty.

Some respondents mention that they do not precisely know what energy poverty means or who energy-poor people in their regions are, or what needs they have. In addition, a lack of resources of underrepresented groups, usually in the form of investment capital and willingness, were mentioned and assumed by some respondents as reasons for their underrepresentation. Respondents report 'communication' as a significant challenge in terms of reaching underrepresented groups. Difficulties in reaching these groups were linked to a lack of knowledge about preferences and the nature and scope of energy poverty and vulnerability, and how it affects households' energy choices. Also, biases concerning low-income groups (they are not interested, or they do not have the means) or the statement that fighting energy poverty is not the responsibility of energy communities (but of social policy) are mentioned as preventing approaches to engage with these issues. Finally, addressing energy poverty, e.g. in the organisational statutes or underrepresented groups, is the exception and not the norm.

5. Implications for energy justice

We apply the survey's results to assess the extent to which RECs in our sample contribute to prior-specified elements of procedural, distributional and recognition energy justice. We assess the extent to which RECs in our sample engage in a social role by addressing underrepresented and vulnerable groups and energy poverty. Further, we discuss opportunities for RECs to increase their capacity to contribute to energy justice. In doing so, we acknowledge that our sample does not fully reflect the broad diversity of RECs' experience at the EU level. The data available does not allow us to make a country-specific analysis or to account for spatial differences between rural and urban settings. Nevertheless, we use the available data to explore this little-studied field to understand better how RECs in our sample provide social benefits and

Table 4
Activities of RECs in our survey.

Type of Activity	N of cases offering activities	Per cent of cases	Among which offer this activity <u>exclusively</u> to members (N)	Of which offer this activity <u>explicitly</u> to underrepresented groups (N)
RE Electricity	38	54	12	9
RE Heating	16	23	10	2
E-Mobility	15	21	7	2
RE Aggregation	16	23	10	4
RE Storage	9	13	6	1

Source: Authors.

Table 5
Addressed underrepresented groups.

Underrepresented group	N	Per cent	Per cent of cases
Low-income households	19	22	27
Energy-poor households	12	13	17
Women	16	16	23
Households with migration backgrounds	12	13	17
Young adults	17	20	24
Other	16	16	23
Total	92	100	

Source: Authors.

Table 6
Services offered by RECs.

Service offered	All cases		Of which address underrepresented groups	Of which do <u>not</u> address underrepresented groups
	N	Per cent of cases		
Lower tariffs compared to market prices	25	35	16	9
Energy efficiency advise	24	34	17	7
Energy efficiency installation	18	25	14	4
Energy efficiency funding	15	21	10	5
Lower share prices/membership fees	19	27	13	6

Source: Authors

Table 7
Reasons for not addressing underrepresented groups.

Reasons for not addressing underrepresented groups	N	Per cent
We need to focus on our core business activities.	8	18
We do not have sufficient means to address these groups.	7	16
We would like to, but we do not know how to identify them and what they need.	3	7
This topic has never been discussed.	15	33
Current regulations and policies hinder the involvement of these groups.	2	4
Other, please specify	6	13
Total	45	100,0

Source: Authors.

Table 8
Reasons for not addressing energy poverty.

Reasons for not addressing energy poverty	N	Per cent
The topic was never discussed.	19	36
We need to focus on our core activities.	11	22
We do not have sufficient means to address energy poverty.	5	10
We would like to, but we do not know how to identify them and what they need.	4	8
Energy poverty is not a problem in our community.	5	10
Other, please specify:	7	14
Total	54	100

Source: Authors.

contribute to prior outlined elements of energy justice.

Reviewing the survey's results, we argue that the first step to contributing to energy justice is recognising that the costs and benefits of and opportunities to participate in energy transition need to be distributed equally among all social groups. Unfortunately, such a distribution is far from being realised. Energy vulnerability often leads to energy poverty creating distinct living conditions that prevent vulnerable households from participating in and benefitting from energy transition. Energy vulnerable and energy-poor households are, in fact, often left behind. Applying the energy justice framework to our survey results highlights that the energy justice tenets are linked to each other, and different aspects reoccur across different tenets.

5.1. *Recognitional energy justice - understanding energy vulnerability*

We argue that recognising vulnerable households' distinct living situations and preferences and the specific conditions that social inequality and (energy) injustices produce is necessary for developing inclusive and empowering procedures. Only based on such recognition and understanding can procedures to engage with and include energy vulnerable households emerge. Thus, recognition is the basis for efficient procedural initiatives to overcome distributional energy injustices.

Concerning recognising the living situation of underrepresented and vulnerable groups and their possible exposure to energy poverty, RECs in our sample vary considerably. Most RECs in our sample are locally embedded, with a great majority of members in RE installations' proximity. However, this local embeddedness does not automatically translate to knowledge about vulnerable and energy-poor households' living experiences and socio-economic hardships, nor does it result in a diverse member structure reflecting the local community's social variety. This finding reflects the in section 2 mentioned danger of a localist trap where RECs are perceived as energy just and democratic merely because they act locally. The survey further points out that RECs' social role is not reflected in the organisational purposes. Both human and financial resources are limited and aligned to promoting renewable energy, likely restricting the engagement in additional activities. Also, as pointed out earlier, motivations to initiate and run a REC differ between economic, ecological, and social motives. While 7 cases mention economic purposes, energy poverty is mentioned only once. Some RECs report unwillingness to accept and engage in a social role by providing social

benefits to different social groups. In general, unawareness of underrepresented groups and their needs and of energy poverty together with a need to focus on core business activities are the primary reason for not engaging in a social role (see Table 7 & 8).

Despite these challenges, 30 cases (42%) report addressing vulnerable households and providing social benefits. However, among the RECs addressing underrepresented and vulnerable groups, there is a discrepancy between those highlighting the need for and challenges of setting up specific communication and engagement channels and those reporting to achieve this aim through general engagement activities. Unfortunately, due to incomplete data, we are not able to assess which approach is more successful. Nonetheless, RECs in our sample and in other practitioners' studies (e.g. Caritas Stromsparcheck in Germany) report difficulties reaching and engaging with vulnerable groups. Therefore, we argue that a lack of specific engagement and information activities targeting vulnerable groups reflects both a lack of recognition of their specific needs and highlights a procedural shortcoming that we will explore in greater depth (see 5.2).

Finally, RECs reporting to address vulnerable groups through specific measures successfully stress the importance of collaborating with partners to share knowledge and good practice. RECs further point out that a general lack of resources and knowledge often restricts the engagement with underrepresented groups and energy poverty. This highlights the potential of collaborating with partners that bring in expertise and additional resources as a condition to develop procedures that facilitate the participation of underrepresented and energy-poor groups. Table 9 summarises our findings regarding recognitional energy justice.

5.2. Procedural energy justice - participation of underrepresented groups

To assess RECs' procedures to engage with vulnerable and underrepresented groups and mitigate energy poverty, we asked whether RECs (i) offer lower membership fees or share prices (see table 6) and (ii) target vulnerable and underrepresented groups with specific information and engagement campaigns. Indeed, 19 RECs (27%) offer reduced membership fees or share prices, of which 13 (18%) report to address underrepresented groups. However, the understanding of reduced membership fees or share prices perceived as enabling broader participation varies. Respondents understand share prices ranging from 50€ to 3000€ as facilitating the participation of underrepresented and vulnerable groups. This points to a lack of understanding of the financial constraints these groups often face. Other indicators such as the average minimum financial participation of 545€ per member in German RE cooperatives [97] further highlight procedural shortcomings. Such high membership fees underpin a limited understanding of (energy) vulnerability and the exclusion effect financial membership requirements entail.

Regarding information and engagement activities, 30 RECs (42%) indicate addressing underrepresented and vulnerable groups. However,

Table 9
Applying recognitional justice to the survey's results.

Element	Indicator	Challenges	Opportunities
Awareness of energy vulnerability and energy poverty	Knowledge about energy vulnerability & poverty, preferences & living situation of vulnerable and energy-poor households	Lack of human & financial resources, of knowledge about vulnerability, of social purpose	Collaboration with partners to share knowledge about energy-poor households
Engagement of vulnerable energy consumers	Engagement with energy vulnerable and energy-poor households	Competitive market environment	

Source: Authors.

only 6 cases (8%) do so through specific information and engagement activities targeting vulnerable and underrepresented groups. The rest states to address these groups through general engagement and information activities without a specific focus on addressing underrepresented groups' needs. This is an example of how a recognitional shortcoming - not recognising vulnerable groups' specific needs - translates to a procedural shortcoming, that is, not offering targeted information and engagement activities.

On the other side, 7 RECs in our sample point out the need for specific information and engagement activities. This group consists both of RECs addressing underrepresented groups and of RECs stating not to address them. Here, challenges regarding communication with the target group such as language-used and available communication channels were pointed out but also financial restrictions on the side of underrepresented groups, e.g. lack of investment capital as a barrier for participation. Again, RECs mention a lack of human capital as a reason for not engaging in a social role: "We are volunteers and do not have extra time for this besides our projects". Further, RECs report a lack of financial resources as the reason for the lack of procedural initiatives. However, it remains unclear why some RECs report these factors and still successfully address vulnerable groups while others report these factors as a reason for not addressing these groups. Again, the limited evidence we have points at the role of collaborating with other organisations to address underrepresented and vulnerable groups successfully. Here, a wide range of possibilities is mentioned, among which cooperation with schools, NGOs, charities, local municipalities, and other RECs.

As an interim result, we note: on the one hand, we observe a lack of recognising vulnerable groups' needs and the restrictions (financial) membership prerequisites entail. This lacking recognition leads to insufficient procedures to engage with and include underrepresented and energy-poor groups. On the other side, we observe a lack of resources prohibiting RECs from engaging in such activities. Here, a restricted business model, embedded in a competitive market environment, enhances the focus on securing economic competitiveness and survival. Further, an organisational purpose other than justice limits RECs' capacity to engage in procedures linked to energy justice.

Thus, at least for a subgroup of RECs in our sample, an enabling framework that provides tangible benefits to those RECs engaging in a social role [24] would enhance their capacity -RECs could use more resources - to engage in energy justice. Nevertheless, even in the absence of such enabling conditions, good practice examples exist: on the Danish Island of Aero [98], the local renewable energy project intends to empower all local citizens to participate. In cooperation with a local bank, they offer zero-interest loans to finance vulnerable households' membership. In the Belgian city of Eklo, the city administration buys shares of the local REC and transfers them to local energy-poor households granting them access to lower energy prices. Also, in Belgium, Pajopower reaches out to people in socially vulnerable neighbourhoods with their "Kyoto obile", driving around in a funny looking vehicle to spark people's curiosity and gain trust by being present and engage in the community. They share information on energy savings and renewables and teach locals to switch energy suppliers, to take action in their private homes and to apply for subsidies. In France, "les Amies d'Enercoop" collects donations made by members of the REC Enercoop to fund energy poverty measures. In Portugal, Coopernico offers solar installations to NGOs working with vulnerable households. Table 10 summarises our findings regarding procedural energy justice.

5.3. Distributional energy justice - benefits shared among members

We apply distributional energy justice to the distribution of RECs' (material) outcomes to different social groups. We understand such distribution as the result of inclusive procedures based on recognising different groups needs and preferences. In this survey, (material) outcomes in the form of services are access to (i) lower energy tariffs, (ii)

Table 10
Applying procedural justice to the survey's results.

Element	Indicator	Challenges	Opportunities
Access to information	Overcoming barriers for participation:	High share prices	Collaboration with partners to share good practices
Access to membership	- reduced	Lack of targeted information	Redesigning financial participation
Access to decision making	membership fees	campaigns	Adequate and accessible engagement tools
Absence of bias	-lower share prices for vulnerable groups	Lack of targeted engagement	
Representation of stakeholders	- targeted information and engagement activities	activities	

Source: Authors.

energy efficiency measures and (iii) energy poverty alleviation. Furthermore, given that membership often determines access, we discuss (iv) membership diversity as well.

In general, 25 cases (35%) offer lower tariffs compared to market prices, 29 cases (41%) offer at least one form of energy efficiency measure, and 19 cases (27%) offer lower share prices or membership fees. Moreover, these already low numbers are further reduced when looking at RECs explicitly offering these services to underrepresented groups (see Table 6). Thus, we observe a distinction between RECs sharing their benefits and services directly with their members and those sharing their benefits and services indirectly through external activities targeting vulnerable households.

Addressing energy poverty through distributing beneficial outcomes to energy-poor households is another aspect relevant for distributional energy justice. Unfortunately, in our sample, only 13 cases (18%) report addressing energy poverty. This may be linked to the overrepresentation of German RECs in our sample and the fact that energy poverty is not discussed in Germany. However, this also points at a general lack of awareness of energy poverty (see Table 8), challenging RECs' potential to engage in energy poverty alleviation.

In 28 cases (40%), access to the above-mentioned services is linked to membership. Therefore, membership diversity is an additional indication of distributional energy justice. Here, we observe an underrepresentation of women both among members and board members (on average less than 30 % of members are estimated (by respondents) to be female). During our interviews, it became clear that RECs often do not collect membership data to assess member diversity. Apart from gender, assessing which groups are most underrepresented and including categories such as age or ethnicity is difficult. Moreover, 41 cases (58%) report not addressing underrepresented groups at all (see Table 5). In general, on one side, energy prices and low efficiency are among the primary energy poverty drivers. On the other side, membership in RECs often grants access to more affordable energy and energy efficiency. Thus, these results highlight the importance of opening up membership to vulnerable groups to enable access to these benefits.

Moreover, 68 cases (96%) link control of the REC (and deciding which activities to focus on) to membership. A relatively homogenous member structure is likely reflected in decision-making outcomes which may reproduce biases and prejudices towards the participation of underrepresented groups (e.g. they lack knowledge or have other things in mind rather than participation). Further, RECs often rely on volunteers, among whom pensioners, often retired men with technical education backgrounds⁵. Often, these men's living reality is substantially different from those of vulnerable groups; thus, they may have a hard time understanding vulnerable groups' needs and preferences. This could contribute to biased imaginations about vulnerable groups' living

situation, needs and preferences as reported in our survey: "they do not want to participate"; "they are not interested in these topics"; "a minimum share price of 500€ is low enough to enable participation for all". Such biases, in turn, enforce inequality regimes - interlocked practices and processes that result in continuing inequalities in organisations. Table 11 summarises our findings regarding distributional energy justice.

As a final remark, investigating RECs' perspective in which vulnerable groups remain underrepresented does not reveal the needs of vulnerable groups. Therefore, additional efforts are necessary to explore vulnerable groups' perspectives. Also, and this is relevant to all our findings, we must assume that only those RECs which show a specific interest in the questions raised replied to our survey. Thus, those RECs that received the survey link but did not identify with the questions raised probably refrained from participating. Therefore, respondents are self-selected, and we cannot present the perspective of those RECs not interested in this paper's raised issue and thus do not know much about the reasons for their lack of interest.

6. Conclusion

The liberalisation of the energy market, although very competitive, has enabled entrants such as RECs to become new energy actors. To differentiate their role from other incumbents, they are expected to combine cost-effective and cost-competitive clean energy with greater equity and a social role. Our research engages with the high expectations set on RECs to become democratic, transformative and equity-enhancing actors for a just transition.

RECs actively contributing to energy justice by engaging with vulnerable and underrepresented groups and providing access to their beneficial services to alleviate energy poverty remain the exception. While our research highlights their willingness, RECs express various restrictions and challenges, limiting their capacity to address energy justice. In general, we observe that, while most are locally embedded, limited understanding of and engagement with energy vulnerability prevails. As a result, the recognition of energy (in)justices, the implementation of adequate procedures to involve vulnerable groups to provide them with a voice and deliver fairer energy services are limited. In this light, RECs report financial instability, lack of personnel, and knowledge about energy poverty, limiting their ability to engage in a social role. In general, the many differences between RECs must be acknowledged. While some are interested in engaging in or already engage in energy justice, others do not resonate with the energy justice concept. Consequently, referring to RECs as equity-enhancing actors of a just transition and contributing to energy justice must be done more carefully than is currently the case. Ideally, national legislation would link enabling conditions for RECs to the requirement to engage in a social role. In consequence, RECs would gain an advantage when engaging in activities linked to energy justice.

Additional research is necessary to extend this paper's country focus to provide representative insights covering the broad geography of the

Table 11
Applying distributional justice to the survey's results.

Element	Indicator	Challenges	Opportunities
Access to benefits	Membership diversity	Membership/participation determines access to benefits	Social energy tariffs for vulnerable households
Access to services	Lower tariffs for vulnerable groups		Provision of additional services
	Lower share prices for vulnerable groups		Collaboration with partners to share benefits indirectly
	Energy efficiency services targeted at vulnerable groups		

Source: Authors.

⁵ A study in Germany confirms our findings and concludes that men volunteer more often in technical areas than women [99].

different circumstances experienced by RECs in Europe. Despite the limited scope of the survey, we found some good practices highlighting the importance of collaboration with other organisations. Still, additional research could assess further the impact of EU legislation on promoting RECs' social role as key actors for a just transition. Empowering RECs to step up to their social role by addressing vulnerable households depends on understanding the many restrictions faced by RECs on one side and those of vulnerable groups on the other side. In particular, based on a thorough understanding of RECs member structure, future research should analyse the effect of different engagement strategies on different social groups. Finally, the major challenge lies in understanding vulnerable groups' perspectives on participating in RECs to ensure energy justice for all.

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.

Acknowledgements

The authors like to express their acknowledgements to the respondents of the survey and the key experts they interviewed. This article is based upon work from COST Action European Energy Poverty: Agenda Co-Creation and Knowledge Innovation (ENGAGER 2017–2021, CA16232) supported by COST (European Cooperation in Science and Technology – www.cost.eu).

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