Deriving a framework for monitoring and evaluating energy justice of citizen energy communities

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Abstract

Communities of citizens which produce, store, trade and distribute renewable energy are changing the energy system. In this paper we derive and present an innovative framework for monitoring and evaluating the quality of end user engagement in energy communities. The framework is based on the model "The Voicer" for evaluating citizen participation, thereby drawing from a rich theoretical body of literature on environmental justice and energy justice This paper presents and discusses the results of applying and adapting the framework to the context of seven developing energy communities in five countries in the Horizon2020 project Lightness. The novelty of this framework is that it is tailored to end user engagement participation processes related to the initiation of energy communities. It considers the relevance of aspects of social justice for digital energy trading platforms and demand response systems. While implementation of the framework in the project is still in its early stages, some relevant lessons for energy community and just engagement policies in Europe emerge. As such, the framework proposed in this paper has the potential to serve policy makers, researchers and practitioners as an innovative tool for assessing matters of justice in energy communities.

Introduction

The EU Clean Energy for all Europeans Package sets targets for a cleaner energy supply and a more accessible electricity market for all Europeans (European Commission, 2019). One aim of the new electricity market design is the active participation of consumers, individually or through 'Citizen Energy Communities (CECs)', in various parts of the electricity market (Heldeweg & Saintier, 2019). This includes, apart from consumption, also the generation, selling, sharing or storage of energy. As a result of this package, for the first time consumers will get the right to request a smart meter and a dynamic price contract that allows them to be rewarded for shifting consumption to times when energy is widely available and cheaper (European Union, 2018, European Union, 2019).

The Horizon2020 project Lightness[1] investigates the potential of citizen energy communities to contribute to the objectives of the new market design. More specifically, the project aims to initiate and examine seven pilots energy communities in five EU countries (Espeche, 2019). In these communities, renewable and non-renewable electricity will be either traded between the participants before the meter, i.e. before entering the electricity grid or via the grid. The project will look in particular into the energy justice aspects of the engagement of these communities. In the literature, the issue of social justice in relation to energy has been increasingly addressed. Proponents of *energy justice* and of the preceding, more general concept *environmental justice* advocate a shift from a technocratic perspective on the energy system towards a human-centred one (Miller et al., 2013, Sovacool & Dworkin, 2015, Jenkins et al., 2015). Equal and secure access to affordable energy and impartial procedures are the centre of the latter perspective (McCauley et al., 2013, Sovacool & Dworkin, 2015). The main

1. The Horizon2020 project Lightness, Registration number 953020, started in December 2020 and will run until November 2023.

elements of *energy justice* are *justice through recognition, procedural justice* and *distributional justice*, while environmental justice adds the aspects of *capabilities* and *responsibilities* (Schlosberg, 2004, McCauley et al., 2013, Schlosberg, 2013, Davoudi & Brooks, 2014, Jenkins et al., 2015, Sovacool & Dworkin, 2015, Aygeman et al., 2016). Currently, systematic assessments of justice in the context of energy communities are lacking (Savaresi et al., 2020). Based on environmental justice literature, Breukers et al. (2016[a]) developed a framework for just engagement of local energy communities called "The Voicer". The model is applied to monitoring and evaluating energy justice while initiating and developing the seven CECs in the Lightness project. The project is still in its early phases; therefore, preliminary results are presented for discussion and further application in the project.

The remainder of this paper is structured as follows: Firstly, an outline of the state of energy communities and their role in the EU energy landscape is given. The pilot projects of the Lightness project are described. Secondly, understandings of justice in relation to energy communities are discussed. Based on The Voicer a list of key indicators for just engagement in energy communities are derived. Thirdly, the approach of engaging end users in the seven pilot project within Lightness is described. The fourth section provides a preliminary assessment of aspects of justice in the pilot energy communities. The findings are used to embark on a discussion about the limitations and applicability of the framework.

Energy Communities

The European Commission sees energy communities as a promising pathway to increase public acceptance of renewable energy projects, boost citizen participation in the energy transition and to mitigate energy poverty (Cowell et al., 2011, European Union, 2018, art. 67, 70). According to the European Commission, in 2030 energy communities could own 17 % of all installed wind capacity and 21 % of installed solar capacity (European Commission, 2019).

Two key recent EU Directives, the revised Renewable Energy Directive (REDII) and the recast Directive on the internal electricity market (IEMD), each give their own definition of energy communities. The REDII defines a *renewable energy community* (REC) as a "legal entity" which "is based on open and voluntary participation, autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects". The primary purpose of an REC "is to provide environmental, economic or social community benefits for its shareholders or members […], rather than financial profits". More specifically focused on citizens, the IEMD defines a *citizen energy community* (CEC) as "a legal entity" which "is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons" with the "primary purpose to provide environmental, economic or social community benefits to its members or shareholders […] rather than to generate financial profits". The activities which energy communities engage in are the "generation […], distribution, supply, consumption, aggregation [and] storage [of energy]" as well as providing "energy efficiency services […] to its members or shareholders".

DESCRIPTION OF PILOT PROJECTS IN LIGHTNESS

Lightness involves seven pilot projects in five countries, one each in Italy, France, Poland and Spain and three in the Netherlands. The communities at the pilot sites are based upon a collective need for energy, sharing one apartment building, several blocks, one cooperative supplier, being situated in one business park, or forming a newly built small neighbourhood of zero-on-the-meter (ZOM) houses (Table 1).

Before the start of the Lightness project, none of the initially existing community structures within the seven pilot sites can be regarded energy communities. The aim of the project is to initiate and develop a CEC in each of the pilot sites, based on the existing, larger community. A pilot project is set up in each of the communities with the aim to assess and develop the necessary technological and socio-institutional conditions for fostering a CEC. The particular characteristics of the developing CEC depend on the respective local context and will be developed throughout the engagement procedure alongside participants of the pilot project. Participants will make use of a digital platform to automatically trade energy with their peers and monitor their own energy use. It contains additional features such as gamification to incentivize energy efficient behaviour. Participants provide feedback on their experiences with the platform and about their engagement within a developing community by the means of surveys, workshops and interviews. This feedback serves as input for monitoring and evaluating the justice of each CEC pilot project.

Italy (Cagliari, 'Condominium' apartment building)

In Italy, one apartment building or 'condominium' with eight apartments in the village of Cagliari, Sardinia, is involved. With financial aid from the "SuperEcoBonus 110 %" subsidy the building is being renovated since January 2021 until the end of the summer 2021. After the renovation, all apartments will be equipped with smart meters. The apartment owners cooperate in an owners' association responsible for collective building issues. They are assisted by a technical company for execution of building works. All residents will cooperate in the energy community to be set up.

France (Valence, Rovaltain business park)

The French pilot site is the Rovaltain business park located in Valence. It includes a total of 150 businesses (Rovaltain, 2021). A group of companies are in the process of forming a legal entity for exchanging energy as a community. This process is expected to be completed at the end of the first quarter of 2021.

Spain (Alginet, Cooperativa Elèctrica d'Alginet)

The Spanish pilot project is located in the village of Alginet close to Valencia. Its energy is provided by a cooperative energy supplier, the Cooperativa Elèctrica d'Alginet (CEA) which has been in existence since the 1930s. Almost all households in Alginet (13,000 inhabitants) are 'socios' of CEA, allowing them to elect the governing body of the cooperative. Next to supplying energy to the socios, CEA is also closely involved with the village community as a whole. The initial CEC will consist of a small selection of the CEA socios that will be recruited for voluntary participation in the pilot project.

Table 1. Characterisation of pilot projects.

Existing energy related community	Main characteristics	Size of existing community	Size of CEC pilot community aimed at
Italy (Cagliari – Condominium)	One apartment block with cooperative of apartment owners dealing with all building issues	8 households	8 households
France (Valence – Rovaltain business park)	Innovative business park	150 businesses	20 businesses
Spain (Alginet)	Existing cooperative electricity supplier, supplying Alginet village	13,000 inhabitants	15–30 households
Poland (Wroclaw, Spoldzielnia Poludnie)	Cooperative of apartment owners dealing with all building issues	260 households	10–20 households
Netherlands (Woerden, Helden and Delft 'Zero-on-the-Meter' (ZOM) and non-ZOM houses)	Owners and tenants of ZOM houses and apartments newly built or renovated by one construction company, plus selection of non-ZOM houses in same neighbourhood	>200 households	15–30 households

Poland (Wroclaw, Spoldzielnia Poludnie)

In Wroclaw, Poland, 35 units with each 60 apartments of the housing community 'Spoldzielnia Poludnie' are involved. Some of these have PV panels installed, as one of the first projects in Poland. Further investments in PVs and heat pumps are planned. From this large community of house owners, a small group of participants will be recruited for setting up the CEC.

Netherlands (Woerden, Helden and Delft, 'Zero-on-the-Meter' (ZOM) and non-ZOM houses)

In the Netherlands, three pilot projects are carried out, one each in residential areas in Woerden, Helden and Delft. Zero-on-the-meter (ZOM) houses and non-ZOM houses are involved in each pilot. In total at least 200 households are estimated to be approached for forming a CEC, most of which belong to the social housing sector.

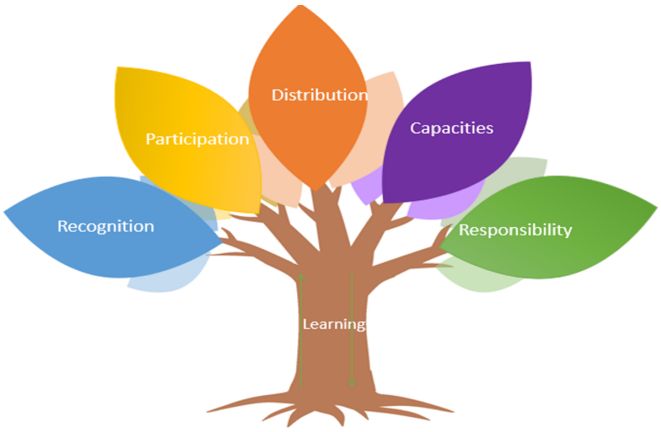

Figure 1. The 'Voicer' Model (Breukers et al., 2016[a]).

Justice and energy communities

The aim of the Lightness project is to set up a 'just engagement' process for all pilots that is monitored and evaluated based on a solid framework grounded in academic energy justice literature.

The "Voicer" model developed by Breukers et al. (2016[a]) previously proved useful in understanding justice issues in local community contexts, see Breukers et al. (2016[b]). It builds on environmental justice theory and includes the elements recognition, participation, distribution, capacities, responsibilities and learning to assume a reflexive approach which takes into account all aspects of energy justice (see Figure 1).

RECOGNITION

Justice through recognition is concerned with the question "who counts?". It is constituted through acknowledging and embracing the diversity of identities, values, wants, needs and histories of all relevant actors. In the pilot projects this concerns citizens and businesses which are potentially involved in the CEC, and other key stakeholders, such as DSOs, ESCOs and policy makers. A failure to acknowledge the relevance of a given stakeholder leads to injustice (*non-recognition* in terms of Fraser, 2009). Walker & Day (2012) for instance describe the case of a large group of households being labelled as "fuel poor" by a UK government program. The fact that households have differentiated and specific needs remained overlooked; for example, elderly and disabled people which sometimes require a higher than average room temperature. A policy which addresses the "inefficient" consumption behaviour of households purely with knowledge dissemination fails to recognize vulnerable and marginalised groups and their needs.

Recognition may also be conflicted by discrediting or disrespecting stakeholders' opinions and points of view, called *misrecognition* by Fraser (2009). In the case of the isle of Lewis, local opposition to a windmill farm was put off by project developers as being based on "selfishness" and "ignorance" of the local inhabitants (Jenkins et al., 2015). The fact that the inhabitants had sincere concerns for their cultural identity was purposefully overlooked to delegitimize their opinion.

PARTICIPATION

Procedural justice revolves around the question "who is heard?". Where recognition is about owning a place at the table, procedural justice is about having a voice and vote at the table (Young, 1990, p. 187, Rasch & Köhne, 2017). A "voice" in this respect is understood as the opportunity to understandably express one's opinion to others, either through speaking on one's own behalf or as a representative on the behalf of a constituency (Jenkins et al., 2015). An actor which is unable to do so or which is not acknowledged as having a stake in the matter is deprived of the opportunity to steer the process or discourse to meet its interests, i.e. to meaningfully participate. This presents a source of procedural injustice. Ethnic or gender minorities are vulnerable to such exclusion. The lack of women represented in the boards and executive positions in energy companies is hence conceived as a violation to procedural injustice (Carlsson-Kanyama et al., 2010). The users of technological devices which facilitate demand response and energy trade are predominantly middle-aged males (Hargreaves et al., 2013). The issue of gender therefore transcends towards the issue of smart technology in CECs. A just engagement procedure furthermore builds on a due decision making processes procedure, based on the principles of informed consent, transparency and an effective vote (Jenkins et al., 2015, Sovacool & Dworkin, 2015). In the Voicer model, procedural justice is taken into account under the header of 'Participation' to emphasize the role of local community members.

DISTRIBUTION

Distributional justice asks "who gets what?". It addresses the allocation of positive and negative impacts across a given number of actors in the energy system (Sovacool & Dworkin, 2015). Distributional justice in the context of energy communities concerns for instance the relatively higher potential of more affluent members of energy communities to profit from the community's services at its centre (Miller et al., 2014, Savaresi, 2020). A concrete example is the increased opportunity of households with smart devices to shift their energy demand, thereby gaining more benefits out of trading with energy (Powells & Fell, 2019). Apart from distributional issues *within* the community, maldistributions can occur *between* the community and external stakeholders. Negative impacts for the community might present themselves in the form of a lack of data privacy or as a large proportion of costs for smart meter and network connection (Milchram et al., 2018, Milchram et al., 2020).

CAPACITIES

The capabilities or capacities approach addresses the question "who can do what?". Building on Sen (2009) "capabilities" are understood as opportunities to converse given goods into actual "functionings" such as leading a fulfilled live. A good health for example increases our capacity to actively participate in the labour market (Nussbaum, 2011). Unjust distributions of impacts can be seen as symptomatic of an underlying maldistribution of capabilities (and responsibilities) (Young, 1990, pp. 15–33, Schlosberg, 2004). Within a CEC, citizens with less time, digital proficiency and access to ICT devices lack the capabilities to meaningfully valorise the services that the community provides (Powells & Fell, 2019, Fjellså et al., 2020).

RESPONSIBILITY

Responsibility poses the simple yet intriguing question of "who does what?". The criteria for justice is that a person must have an effective word of say in what responsibilities he or she takes on and be able to carry out these responsibilities with his or her given capabilities (Davoudi & Brooks, 2014). Energy community members may be confronted with the responsibility of ensuring future generations' welfare and, as a means to this end, to responsibly use energy (Sovacool & Dworkin, 2015, Milchram et al., 2018). The ethical question of how much responsibility an individual should carry emerges at the crossroad of capabilities, just procedures and distributional justice.

LEARNING

The developing CEC make use advanced energy technology such as smart meters and engage in cutting-edge energy efficiency practices, most prominently, virtual energy trading and demand response (DR). Previous Horizon2020 projects acknowledged the catalysing role of *learning* in energy communities (Mlinarič, M. et al., 2019). Learning may increase stakeholders' ability to cooperate, presenting a close link to meaningful participation and mutual recognition. New factual information can build the necessary capabilities for user engagement (Colardyn & Bjornavold, 2004). Building on Breukers et al. (2016[b]), our understanding of 'learning' is broadened to include the process of reflection and evaluation from the side of the project partners most responsible for engagement of end users. As they play an essential role in initiating and facilitating the pilot communities and developing them into CECs, the lessons they draw throughout the process are expected to significantly increase the opportunity to address issues of justice.

In the Lightness project, for each of the six components of the Voicer model, indicators were developed to develop, monitor and evaluate a just engagement process. These indicators are outlined in Table 2.

Lightness engagement experiences so far

The Lightness engagement process was divided into four phases: 1) Recruitment, 2) kick-off, 3) monitoring and 4) evaluation. Given the early status of the project, so far only the recruitment phase has been worked out in detail. It consists of a joint learning process in several workshops with the 'national pilot leads', i.e. partners in the Lightness project which are closely associated with the pilot project or projects in one particular country. The application of the just engagement framework led to the preparation of two engagement tools.

Firstly, based on the Voicer framework outlined above, a template for the recruitment plan was prepared. This encompasses a detailed description of the pilot and community context, an analysis of the pilot readiness, an outline of recruitment strategy and instruments intended to be used, and a planned timeline for the recruitment process. In the description of pilot and community context and the outline of recruitment strategy and instruments, pilot leads were explicitly asked to take into account all elements of the just engagement framework outlined in Table 2. The readiness analysis was based on a further development of the Technological Readiness Framework adopted by the European Commission, encompassing technological, organisational and other types of barriers (Mihaly, 2017).

Table 2. Just engagement indicators in the Lightness project, based on the Voicer model.

Just engagement component	Indicator
Recognition	Needs, wishes and ambitions of community members are recognized.
	Existing formal and informal structures, activities and ambitions of the community are recognized.
	All relevant stakeholders and their respective stakes are acknowledged.
Participation	The group of community members participating in the pilot project are representative of their community in terms of age, gender, education, income and ethnicity.
	Community members have an effective voice and vote in decision-making procedures.
	Full and trustworthy information about the pilot project and the activities deployed therein is readily accessible.
Distribution	Costs and benefits as perceived by the community members and stakeholders are fairly distributed.
Capacities	Each community member is able to participate in a meaningful way given his or her capabilities.
Responsibilities	Expected responsibilities and tasks of participants during the project are made transparent to potential participants.
Learning	Learning of community members and stakeholders is facilitated and actively stimulated throughout the process.

Secondly, a template presentation was developed outlining in detail the 'Lightness value proposition' to potential participants. Responsibilities of participants such as the attendance of monitoring activities are clearly communicated. A participation form to be signed by all project participants will be developed as a follow-up to this presentation template. With the full transparency of costs and benefits of the project to potential participants that is provided in this way, the objective of procedural justice under the Voicer component 'participation' is operationalised in the project.

The initial results of the recruitment process that was designed in this way differ, as was expected from the very different national contexts. In Italy, one of the apartment owners with an energy engineering background that was already previously involved in design of the project was used as a linking pin for interviews with other apartment owners. All eight households in the condominium are likely to participate in the project. Similarly, in Poland the elected CEO of the Spoldzielnia Poludnie housing cooperative was chosen as a key contact for recruitment. In France this role was filled by the business park board, and in the Netherlands by the construction company that built and renovated the zero-on-the-meter houses. Spain was the only exception were no linking pin approach was chosen, given the large size of the community. Here, for the moment a mass media approach is chosen that needs to be further worked out. In none of the cases except Italy, potential participants were approached yet.

Regarding the readiness analysis carried out, in Poland the installation of smart meters was identified as a main hurdle to be taken before the kicking off the engagement. In all other pilot locations, such meters are already installed. A main organisational barrier identified in all countries was the absence of legislation formally allowing peer-to-peer (P2P) trading to participants. Potential financial benefits of the trading therefore are likely to remain 'virtual' to pilots participants, an aspect that needs to be clearly communicated with the end-users interested in the project.

Discussion and conclusions

The Lightness project is operational since a few months at the time of writing this paper. Therefore, all results and conclusions have to be regarded as preliminary. Nevertheless, some interesting observations regarding developing a just engagement framework for energy communities and applying it in practice can be made.

ENERGY COMMUNITIES IN PRACTICE

The definitions of RECs and CECs of the European Union and the European Commission do not adequately capture the nature of the communities that will be developed and engaged in the Lightness project.

The communities that will be developed and engaged in the Lightness project deviate from the definitions of CECs by the European Commission. They are involved in locally generating renewable electricity through solar panels and heat pumps. They offer 'energy efficiency services' by trading electricity at specific moments in time that are financially beneficial to participants and also contribute to energy efficiency and stability of the electricity system as a whole. However, the trading also involves non-renewable electricity that is not locally generated. These aspects would suggest that an adaptation of the definition of RECs or a separate definition for energy trading communities could be relevant for future EU policy making stimulating energy communities.

While not explicitly mentioned as such, the CEC and REC definitions of the European Commission seem to suggest communities that have been initiated by the participants themselves in a 'grass-roots' manner (Seyfang et al., 2013). This is not the case in the Lightness project, where the participants in the project will be recruited in a top-down manner from the larger existing community structure that they form part of. Looking more closely at these larger communities, the social cement that binds its members together differs largely across pilots. In Italy and Poland, shared building issues in general are the reason for forming a building-oriented community. In Spain, the larger community consists of an entire village that was deprived from its own electricity generation in the 1930s. In France, the community consists of businesses that share the same location in the business park. Energy is mostly relevant for them as tenants of a building or as part of a business model which emphasises sustainability or innovativeness. In the Netherlands, zero- and non-zero-on-the-meter houses and apartments are targeted for developing the CEC. Residents of these houses do not form a community as such. An initial concern for energy

is in no case the glue which holds the community together. Instead geographically and infrastructural boundaries have led to the pilot sites being considered a community. The initial driver of these communities to become an *energy* community is not rooted in values and environmental concerns but driven externally, in this case by the Lightness project. The virtue of the just engagement framework presented in this paper is the applicability to these geographically bound, non-grassroots communities. The 'communities' from which the pilot projects are initiated present very common organisational patterns found in large numbers throughout the EU. The framework is theorized to have significant potential in stimulating renewable energy generation and unlocking the demand flexibility of citizens in a just manner.

JUST ENGAGEMENT IN PRACTICE

Implementation of the Voicer components for just engagement in the early phases of the Lightness project leads to several preliminary lessons.

Regarding *recognition* it is clear that the communities involved are very different. Approaches to take into account existing ambitions, structures and stakeholders' views vary accordingly. As already stated, one important observation is that the main ambition of the larger community from which recruitment takes place in Lightness is generally not energy, but rather housing (Italy, Poland), maintaining a village community (Spain), shared location interests as a business community (France) and perhaps shared environmental motivations as tenants or owners of ZOM houses (Netherlands). Such larger community ambitions could be an important entrance point for recruitment, rather than 'energy' as such. It appears that considerable field work, practice and reflection by the pilot leaders is required in order to understand the motivations and ambitions of potential participants. These efforts are estimated to significantly contribute to the recognition of community members. In light of recent studies discovering the misalignment between the goals of supra-national institutions such as the Lightness project and those of local sustainability initiatives, the urgency for a framework allowing to assess recognition in energy communities appears to be high (Breukers et al., 2016[b]).

For a just *participation*, the recruitment instruments intended to be used by national pilot leads do not show a clear differentiation towards different target groups yet. More attention to this aspect in the next steps of the project therefore will be required to allow for, for instance, a representative group of participants regarding gender and age. Also the aspect of using linking pins as intermediaries for recruitment, which each might have their own motivations and networks, deserves some attention. In the future case that intermediaries' interests threaten to undermine principles of procedural justice, recruitment separate from these intermediaries will be required.

The component *distribution* needs in particular further attention regarding financial benefits for participants. While new legislation is in preparation in all pilot countries, this is not likely to be effective quickly enough for the project to allow for P2P trading with financial benefits for participants as opposed to the virtual exchange of energy. Making virtual financial benefits available to project participants similar to those in the legislation in preparation therefore needs to be further discussed.

Looking at *capacities*, digital literacy and access to mobile devices is identified in particular in Poland as an important potential barrier for participation. Here the project, being driven by the application of digital platforms, sets limits towards participation of people who lack such resources. While a minimum of digital literacy will always be required to be able to participate in a meaningful way in the project, specific attention will be paid to making the digital platforms and project communication accessible to residents and potential participants with limited digital literacy or restricted access to suited devices.

Focusing on *responsibilities*, the recruitment process has been designed in such a way that it makes fully transparent what is expected from participants in the project. A participation form to be signed is a further instrument used to make sure that potential participants have fully understood their responsibilities and likely benefits from participation. Next to a project outline and transparent information about privacy aspects and on what will be done with the information provided, the form will also make clear what will be done with the feedback of participants provided in the project. In this way, it is intended to show to participants that they bear co-responsibility in shaping the project's outcomes.

Regarding *learning,* an internal learning process between all project leads has already been set up. After completion, the recruitment phase of the project will be evaluated with these pilot leads, with recruited project participants and if possible also with non-participants from the larger communities. Further learning aspects of the project, in particular with regard to replicability and scaling up of lessons learned for energy community and just engagement policies in the future will be worked out in more detail in the next project and engagement phases.

The justice components which constitute the Voicer model, show that a just engagement of citizens in energy communities is not a given. It is a process that needs to be carefully designed, monitored and evaluated. This is consistent with findings of Forman (2017) and Savaresi (2020). This paper presents, applies and evaluates a framework for just engagement built upon Breukers et al. (2016[a]) and further developed within the Lightness project. The framework is limited in its scope as it refers to local communities without bottom-up origins. At the same time, its possible applicability to communities which are encouraged and stimulated to collaboratively produce, trade and consume energy by external parties, may increase the number of relevant cases manyfold. The first empirical experiences with Lightness are promising, but for final lessons regarding upscaling towards a large-scale application of just engagement of energy community in Europe, there is still a long way to go. If the implicit assumption of EU policies towards energy communities is that they will contribute to public support for the EU energy transition objectives, equal access to, and benefits from, access to such communities should be assured for all European citizens. The important role that energy communities play in the future energy landscape underpins the urgency of tools and frameworks which bear the potential to safeguard energy justice in initiating these communities. The framework we propose and strive to empirically validate within the Lightness project is aimed at giving a response to this call and advance the discussion on means to systematically assess energy justice in the context of energy communities.

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