High expectations and misconceptions – a study on the response of Austrian citizens to Energy Communities

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Abstract.

Since the Austrian Renewable Energy Expansion Act came into force a year and a half ago, approximately 300 Energy Communities (ECs) have been registered in Austria. However, it remains to be seen whether this upward trend will continue, highlighting the need to better understand citizens' expectations and perceptions of ECs in order to further promote their adoption. Therefore, this study explores whether ECs meet citizens' expectations and needs. An importance-performance analysis with a sample of 1073 Austrian residents was conducted. The results indicate that financial and environmental aspects are highly important to potential EC members. Social aspects, on the other hand, are seen as less important and, thus not decisive factors for joining an EC. Concerns exist regarding supply security and data security within ECs. This may be linked to a general lack of information and public knowledge, which can result in the spread of incorrect assumptions on the functioning and values of ECs. To address these concerns, it is important to launch rigorous information and education campaigns that strengthen public dialogue and understanding of ECs.

Keywords: renewable and citizen energy communities, perception, motives and challenges

1 INTRODUCTION

With the Clean Energy for All Europeans Package, the EU has set out a path for a sustainable energy transition with ambitious targets for the expansion of renewables. One initiative aimed at these targets is the establishment of Energy Communities (ECs) as laid down in the Renewables Energy Directive (RED) [1] and the Electricity Market Directive (EMD) [2]. Austria transposed these legal requirements into national law through the Renewable Energy Expansion Act (Erneuerbaren Ausbau Gesetz, EAG) [3] and amendments to the Electricity sector act (Elektrizitätswirtschafts- und –organisationsgesetz ElWOG) [4]. Since these laws came into effect in 2021, so-called Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs) now have a regulatory basis in Austria. With the establishment of ECs, citizens are placed at the centre of the energy transition, evolving from passive consumers to active prosumers who shape their community's power supply – at least this is a common narrative [5, 6]. Advisory offices and service providers for ECs incorporate this narrative and advertise their services and community memberships with various benefits for citizens. These benefits not only include the democratization of energy supply but also social, technical, environmental and economic advantages [7 - 10]. The same applies to academic pilot projects researching energy communities with the aim of shaping ECs based on the needs of citizens (e.g. [11 - 15]). The common goal is to motivate citizens to join or even found their own EC and establish them as a new energy supply standard in Austria. The question

remains: Are these strategies effective? Do energy service providers send the right messages to citizens, and do pilot communities meet citizens' needs?

One and a half years after the EAG entered into force, approximately 300 ECs have been registered in Austria [16], and there has been comprehensive media coverage on the topic. An annual representative survey has shown a high level of interest for ECs among the Austrian public with about two-thirds of people expressing interest in joining an EC [17, 18]. This represents a promising starting point for future developments of ECs in Austria, as this suggests a high potential for future community growth. In order to maintain this trend and reach a wider audience, it is important to understand citizens' expectations and impression of ECs. Only then can the above-mentioned communication strategies effectively provide the right information on the benefits of ECs to their customers and fully leverage their potential.

There is a growing body of literature that discuss the motives and challenges associated with participating in ECs and other community energy initiatives, such as energy cooperatives. In line with the RED, economic, environmental and social benefits are found to be the central categories of motives for joining any community energy initiative. ECs and other community initiatives are expected to foster the expansion of renewables, thereby supporting the global energy transition and reducing CO_2 emissions. Several studies have highlighted these aspects as one of the two main motivations for citizens to join ECs [19 - 25]. The second main motive is monetary, even though ECs are explicitly restricted to being profit-oriented. There is no common agreement whether monetary or environmental motives are more important to citizens. For many, a reduction of energy-related expenses (as it is the case in Austria through grid fee reductions), financial gains by selling self-produced energy, or the opportunity to invest in renewable generation plants are central pull factors [19, 20, 23, 25]. The third group of motivations pertains to social benefits, such as strengthening social cohesion [22, 28, 29] or the region becoming a role model, thereby also improving the regions' image [19, 29]. Another common motivation for joining an EC initiative is to achieve independence from suppliers and energy market changes (e.g. price fluctuations) [23, 26, 27]. Despite the multitude of positive aspects linked to ECs, a few hindering concerns and hurdles remain. One issue is the intense administrative effort required for founding and joining an EC in Austria [24].

While there is research on the motives of and challenges faced by EC members, it remains unclear whether EC initiatives can effectively address these motives and hurdles. Furthermore, there may be misconceptions about the actual performance of ECs due to misinformation or a general lack of knowledge. Joining an EC with inaccurate expectations can lead to disappointment and frustration among the members, ultimately hindering citizens' willingness to participate in ECs.

To address the above-mentioned knowledge gap, this study gathered data from 1073 Austrian citizens to investigate their expectations and perceptions of ECs. Using an importance-performance analysis, the study examines whether citizens' expectations are met and if the proposed values align with the needs of future EC members.

2 METHODOLOGY

An importance-performance analysis [30] of ECs based on six central characteristics

identified via a literature review was conducted. Based on theoretical considerations within the research project and hypotheses from research project testbeds [11], an additional three characteristics were included in the survey, namely grid support, security of supply, and data security. Grid support is a crucial factor for grid operators and therefore serves as a central stakeholder motivation. It can also benefit citizens: grid-friendly EC operations can prevent rising fees linked to necessary network expansions. Security of supply is particularly important in remote areas of Austria, where people experience power outages due to natural disasters. Here, residents are concerned whether ECs can provide enough power for the community, while also maintaining a continuous power flow. Finally, data security is a major concern of testbed participants, as the operator has full access to members' load profiles, which reveal the intrinsic details of an individuals' habits.

The following nine items were selected for the analysis:

1) ECs facilitate the growth of renewable energy and thus support the transition towards sustainable energy systems;
2) ECs are largely self-sufficient in terms of electricity;
3) ECs alleviate the need for further expansion of electricity grids;
4) ECs provide a secure and reliable power supply;
5) ECs provide a role model effect
6) ECs enhance social cohesion among their members;
7) Personal data (e.g. electricity consumption) are kept secure within an EC;
8) EC members can lower their electricity expenses;
9) The administrative effort (e.g. contracts, accounting) required for EC members is manageable.

This study's respondents were asked to rate the perceived performance and the importance for an own participation of the listed- aspects. The ratings for both dimensions were collected using a 5-point Likert scale: Rating ranged from "1 = not at all fulfilled" to "5 = absolutely fulfilled" for performance, and "1= not at all important" to "5 = very important" for importance. Prior to this assessment, a brief explanation of ECs was provided to the respondents.

Data collection took place between April 28th and May 16th, 2022. The respondents were recruited by an online panel provider, representing the Austrian population regarding the distribution of age, gender and educational level. After data cleansing, a total of 1073 respondents were included in the analysis. The sample consisted of 45 % male and 55 % female respondents, with 47.8 % not having completed Matura (A-levels) and 52,2 % having completed Matura or tertiary education. Age groups were well distributed, with 20.5 %, 21.9 %, 20.1 %, 22.2 %, and 15.4 % of the respondents falling in the 18-29, 30-39, 40-49, 50-59, and 60-69 age groups respectively.

For the analysis, the data-centred approach was chosen. Based on the average rating of each dimension (performance and importance), the nine EC characteristics were assigned to the following four categories: "concentrate here" (performance below average, importance above average), "keep up the good work" (performance and importance above average), "low priority" (performance and importance below average) and

"possible overkill" (performance above average, importance below average) [30].

3 RESULTS

The results of the importance-performance analysis are depicted in Table 1, with the arithmetic mean of both dimensions, performance and importance, in the last row. The mean ratings for both dimensions are above the scale average, which implies that all characteristics are expected to be fulfilled by an EC and are important for an individual's EC membership.

Table 1: Results of Performance and Importance rating

	PERF (mean)	IMP (mean)	Diff
Support of Renewables	4.03	4.11	-0.08
Autonomy	3.73	4.19	-0.46
Grid Support	3.63	3.87	-0.23
Supply Security	3.49	4.40	-0.91
Role Model	3.79	3.61	0.17
Social Cohesion	3.70	3.65	0.05
Financial Gain	3.83	4.43	-0.59
Administrative Burden	3.51	4.05	-0.54
Data Security	3.44	4.08	-0.64
mean	**3.68**	**4.04**	

The highest performance rating is given, with an average of 4.03, for the support of renewables expansion. Respondents believe that this will be achieved through the implementation of ECs. Financial gain is in second place, with an average rating of 3.83. About 70 % of respondents believe that they will be able to save money though an EC membership. The lowest performance rating is found for the security of personal data (average of 3.44). In total, 50 % of respondents are unsure if or disagree that their personal data is treated in a safe manner in an EC.

Regarding the importance for the own participation in an EC, financial gain is cited as the most the important factor (4.43). Only 2 % of respondents do not consider energy bill savings to be significant. This is followed by supply security (4.40) and gaining autonomy in power supply (4.19). The support of renewable energy expansion and the energy transition follow in fourth place with an average value of 4.11. In the social realm, the role model aspect (3.61) and social cohesion (3.65), are of minor importance when it comes to closing an EC membership.

As outlined in the methodology and illustrated in Figure 1, the nine items were categorized into four quadrants based on their means. It is important to note that the results solely reflect the perceived performance of these aspects among potential EC members, and do not necessarily reflect the actual performance of existing ECs. The respondent's perception may be based on misunderstandings and inadequate knowledge about ECs due to an existing information gap in Austria. This lack of public discourse and information can lead to two situations: severe overestimation or underestimation of actual performance. Implications thereof are discussed in the next section.

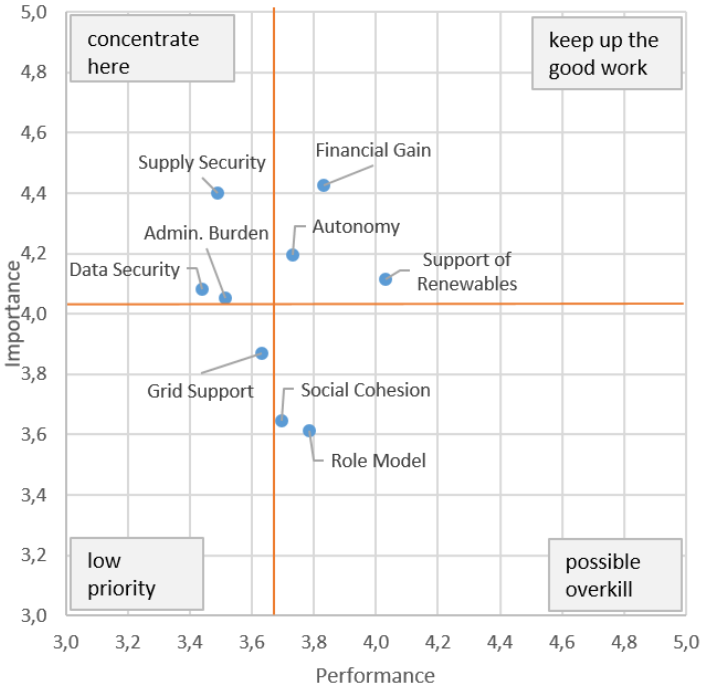

Figure 1: Importance-Performance Analysis on EC Characteristics (n=1073)

4 DISCUSSION & CONCLUSION

The "keep up the good work" section illustrates characteristics that are deemed important for one's own membership and are already perceived as being fulfilled within an EC. These findings are in line with existing literature on the topic. However, there may be knowledge gaps regarding **autonomy** and **financial gains**, which can lead to false expectations and long-term frustration since ECs generally do not provide full energy autonomy and do only provide comparably low cost savings. Thus, further research is needed to determine the level of savings that people actually expect and are willing to accept. Although ECs are viewed as contributing positively to **energy transition**, there is a lack of long-term evaluations on the actual environmental impact of ECs. Consequently, it remains unclear whether ECs foster the establishment of, e.g. new PV-systems, or simply reframe energy account by operating existing generation plants within an EC.

Most attention should be paid to the section "concentrate here", which contains items of high importance but (comparably) low perceived performance. This is of special interest, as these (unsatisfactory) characteristics are significant barriers to attracting new members as they hinder citizens' willingness to participate. One the one hand, they are essential for citizens' willingness to participate, but on the other hand people have the feeling that their expectations will not be met. Therefore, improving the performance of these characteristics is vital to reduce the risk of member deterrence.

Supply security and data security are two aspects that require much attention. Although they are important motives for participation, their perceived performance is below average. For instance, people need to be better informed about residual current supply by utilities to understand that supply security remains the same as with traditional central

power supply. Through proper awareness raising campaigns on the supply security within ECs, this barrier can be addressed. **Data security** is another element of high importance to EC participants, as in any process involving digitalisation. This mistrust may arise due to the fact that ECs can also be run by private individuals who may not possess the appropriate knowledge and tools to comply with high data security standards. Additionally, some people may mistrust (larger) companies, such as grid operators, who have access to smart meter data within an EC. Further research is needed to investigate these concerns and address existing data security issues.

Another important aspect is the **administrative burden**, which respondents consider to be high. To attract new members, this burden needs to be minimized as much as possible. This is also emphasized in [24], which suggests that EC service providers should simplify the participation process, as members currently have to go through many complex contractual agreements. This level of complexity may deter individuals from joining an EC.

Only one item is assigned into the section "low priority", namely **grid support**. This was expected, as it is not relevant to people's willingness to participate. Therefore, it should be given the lowest priority in communication activities. However, it is interesting to note, that people assign a higher importance to ECs being grid-friendly than to providing social cohesion, for example.

The section "possible overkill" gave way to interesting results. The two aspects regarding social benefits, namely **role model** and **social cohesion**, which are often discussed in EC narratives and demanded by the RED, are of least importance for prospective members. This result contradicts literature findings in [19, 22 and 27-29], and these aspects are already perceived as fulfilled. Consequently, they are not a decisive criterion for joining an EC, and intensified information flow on these topics may meet the lack of interest among customers. Admittedly, also within this specific study, social aspects are still rated as being slightly important. However, compared to all other characteristics, even grid support, social aspects are of least interest to respondents regarding the own participation in an EC.

On the other hand, to foster the social impact and value of ECs, other social aspects such as the support of vulnerable groups may be decisive for joining an EC. However, evidence on the actual social impact of ECs is currently lacking, and although the Austrian EAG and RED claim for social community benefits (Art 2, 16b), an explanation thereof is still missing.

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5 REFERENCES

[1] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources. 2018. online:https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC (accessed on 31.03.2023).

[2] Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU. 2019. Available online: https://eur-lex.europa.eu/legalcontent/en/TXT/?uri=CELEX:32019L0944 (accessed on 31.03.2023).

[3] EAG. Österreichisches Parlament. Bundesgesetz über den Ausbau von Energie aus erneuerbaren Quellen (Erneuerbaren-Ausbau-Gesetz–EAG). 2021. BGBl. I Nr. 150/2021. Available online: https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20011619 (accessed on 31.3.2023).

[4] ElWOG. Österreichisches Parlament. Bundesgesetz, mit dem die Organisation auf dem Gebiet der Elektrizitätswirtschaft neu geregelt wird (Elektrizitätswirtschafts- und -organisationsgesetz 2010 – ElWOG 2010), BGBl. I Nr. 110/2010. Available online: https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20007045 (accessed on 31.03.2023)

[5] European Commission (2023). Energy Communities. Available online: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en (accessed on 31.3.2023).

[6] Bielig, M., Kacperski, C., Kutzner, F., & Klingert, S. (2022). Evidence behind the narrative: Critically reviewing the social impact of energy communities in Europe. Energy Research & Social Science, 94, 102859. https://doi.org/10.1016/j.erss.2022.102859.

[7] Österreichische Koordinationsstelle für Energiegemeinschaften (2023). Energiegemeinschaften in Österreich. Available online: https://energiegemeinschaften.gv.at/ (accessed on 31.03.2023).

[8] Energiezukunft Niederösterreich (2023). Energiegemeinschaften. Available online: https://www.ezn.at/#energiegemeinschaften (accessed on 31.03.2023).

[9] neoom (2023). strom sharing. Available online: https://neoom.com/produkte/app/kluub (accessed on 31.03.2023).

[10] 7energy (2023). Energiegemeinschaften. Available online: https://7energy.at/energiegemeinschaften (accessed on 31.03.2023).

[11] CLUE project (2023). Concepts, Planning, Demonstration and Replication of Local User-friendly Energy Communities. EU H2020 grant No 775970. Available online: https://project-clue.eu/ (accessed on 31.03.2023).

[12] Green Enery Lab (2023). UCERS - Greater involvement of participants and freely available data platform for energy communities of the future Available online: https://greenenergylab.at/en/projects/ucers/ (accessed on 31.03.2023).

[13] FFG (2023). DigitalEnergy4All with Digital Citizen Energy Communities. Available online: https://www.ffg.at/laura-bassi-4.0-digitalisierung-und-chancengerechtigkeit-

digitalenergy4all (accessed on 31.03.2023).

[14] Green Energy Lab (2023). Beyond - Neue Marktdesigns für optimierte lokale und regionale Energiesysteme. Available online: https://greenenergylab.at/projects/beyond/ (accessed on 31.03.2023).

[15] R2EC (2023). Regionale Erneuerbare Energiezellen. EU H020 grant No 775970. Available online: http://r2ec.at/ (accessed on 31.03.2023).

[16] Dvorak, E., (2023). Unterstützende Maßnahmen und Services für Energiegemeinschaften. In: Konferenz ENergiegemeinschaften 08.03. – 09.03.2023. Available online: https://www.youtube.com/live/oo5-HXvk6kk (accessed on 31.03.2023).

[17] Hampl, N., Hoffmann, W., Sposato, R., Marterbauer, G., Nowshad, A., Strebl, M., & Salmhofer, A. (2020). Erneuerbare Energien in Österreich—Der jährliche Stimmungsbarometer der österreichischen Bevölkerung zu erneuerbaren Energien [Report]. Institut für Produktions -, Energie und Umweltmanagement, Alpen Adria Universität Klagenfurt; Institut für Strategisches Management, Wirtschaftsuniversität Wien; Deloitte Österreich; Wien Energie.

[18] Hampl, N., Sposato, R., Marterbauer, G., Nowshad, A., Strebl, M., & Salmhofer, A. (2021). Erneuerbare Energien in Österreich—Der jährliche Stimmungsbarometer der österreichischen Bevölkerung zu erneuerbaren Energien. Institut für Produktions -, Energie und Umweltmanagement, Alpen Adria Universität Klagenfurt; Institut für Strategisches Management, Wirtschaftsuniversität Wien; Deloitte Österreich; Wien Energie.

[19] Conradie, P. D., Ruyck, O. D., Saldien, J., & Ponnet, K. (2021). Who wants to join a renewable energy community in Flanders? Applying an extended model of Theory of Planned Behaviour to understand intent to participate. Energy Policy, 151, 112121. https://doi.org/10.1016/j.enpol.2020.112121

[20] Doci, G. (2021). Collective Action with Altruists: How Are Citizens Led Renewable Energy Communities Developed? Sustainability, 13, 507. https://doi.org/10.3390/su13020507

[21] Kalkbrenner, B. J., & Roosen, J. (2016). Citizens' willingness to participate in local renewable energy projects: The role of community and trust in Germany. In Energy Research & Social Science (Bd. 13, S. 60–70). https://doi.org/10.1016/j.erss.2015.12.006

[22] Schall, D. L. (2020) „More than money? An empirical investigation of socio-psychological drivers of financial citizen participation in the German energy transition", Cogent Economics & Finance, Vol. 8, No. 1, S. 1777813

[23] Heuninckx, S., Boveldt, G. te, Macharis, C., & Coosemans, T. (2022). Stakeholder objectives for joining an energy community: Flemish case studies. Energy Policy, 162, 112808. https://doi.org/10.1016/j.enpol.2022.112808

[24] Neumann, H.-M., Stollnberger, R., Stortecky, S., Etminan, G., & Schrammel, J. (2020). Studie-Energiegemeinschaften.pdf. Wien Energie.

[25] Hackbarth, A., & Löbbe, S. (2022). What motivates private households to participate in energy communities? A literature review and German case study. Energy Communities, 153–166. https://doi.org/10.1016/B978-0-323-91135-1.00026-2

[26] Boon, F. P. & Dieperink, C. (2014) „Local civil society based renewable energy organisations in the Netherlands: Exploring the factors that stimulate their emergence and

development“, Energy Policy, Vol. 69, S. 297–307.

[27] Soeiro, S., & Dias, M. F. (2020). Motivations for Integrating a Renewable Energy Community: Evidence for Spain and Portugal. 1–6.

[28] Savelli, I., & Morstyn, T. (2021). Better together: Harnessing social relationships in smart energy communities. Energy Research & Social Science, 78, 102125. https://doi.org/10.1016/j.erss.2021.102125

[29] Martens (2022) „Investigating subnational success conditions to foster renewable energy community co-operatives - 1-s2.0-S0301421522000210-main“, Energy Policy, Vol. 162, 112796.

[30] Martilla, J. A., & James, J. C. (1977). Importance-Performance Analysis. Journal of Marketing, 41(1), 77–79. https://doi.org/10.1177/002224297704100112