ENERGY COMMUNITIES: EVALUATION OF EXISTING EXPERIENCES IN AUSTRIA AND ASSESSMENT OF FUTURE PERSPECTIVES

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Abstract

The energy system is undergoing a structural change to achieve the climate targets of the Green Deal set by the EU. As a result, the Renewable-Expansion-Law Package came into effect and laid the foundation for establishing renewable energy communities (RECs). RECs enable the collective generation and utilization of energy. They are considered an important tool to increase decentralization and decarbonization. At the same time, prosumers and consumers benefit from a favourable tariff and price structure for electricity procurement and feed-in. The relevance of RECs in Austria is demonstrated by the registered number quadrupling from 161 to 675 between the end of 2022 and mid-2023 [1]. In the future, RECs may play a significant role in the energy system. This research paper aims to evaluate the existing experiences of Austrian RECs and asses their future perspectives. Therefore, the following research question arises: What are the current experiences and future perspectives of Austrian RECs?

Method of approach

The method of approach for the analysis of RECs in Austria consists of qualitative and quantitative methodologies. The data collection is based on a survey of selected RECs. In-depth interviews with selected RECs supplement the analysis to extract detailed insights and experiences. In addition, their generation and consumption data from the EDA portal is collected and analyzed. Quantitative indicators such as degree of self-sufficiency and degree of self-consumption will be utilized as benchmarks for a REC's success measurement. The contribution of this paper is that actual data and experiences of RECs in Austria are analyzed, making it possible to identify strengths and weaknesses and assess future potentials.

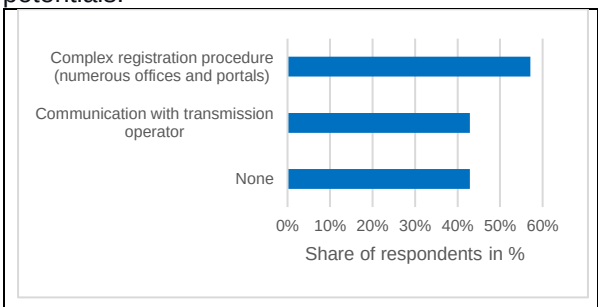

Fig. 1: Difficulties in founding a REC

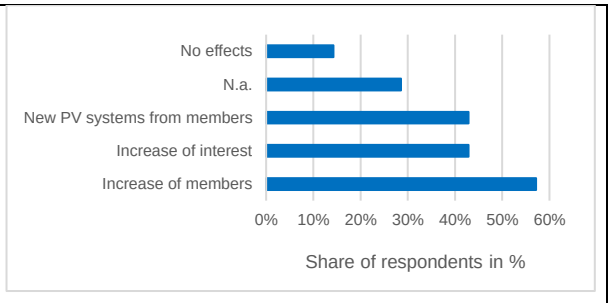

Fig. 2: Effects of the high electricity prices in 2022 on REC

Results

The results of the surveys and interviews with RECs provide insights into RECs' structures and experiences. In general, RECs are mostly established within a year by private individuals or service providers. They are commonly organized in the form of associations and cooperatives. Difficulties can arise before and during the establishment of a REC, such as the complex registration procedure and communication with the grid operators (see Figure 1). The main reasons for the non-establishment of RECs are the high efforts in founding and administration, coordination problems, and little acceptance and understanding among citizens. The administrative effort is often an additional hurdle. As a remedy, many RECs use a service provider for ongoing operations, e.g., for internal billing processes. The structure of RECs in Austria varies in terms of the number of prosumers, consumers, and types of energy, whereas electricity generated by solar energy is the most common. Since their establishment, the RECs have typically seen growth in both membership and generation capacity. Some of the members of the RECs own small storages and electric cars. Large consumers such as heat pumps, electric heating systems, and businesses can be found in every REC. The main motivations for participating in RECs are ecological and economic reasons, mainly sharing self-generated electricity with neighbours and reducing electricity costs. A REC is only an incentive for consumers if the electricity purchase costs are lower than the household electricity tariff from a utility company and for prosumers

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if the REC's remuneration for the electricity fed into the grid is higher than the feed-in tariff. Prosumers are often reluctant to participate in a REC because the grid operators' feed-in tariffs are very high. The RECs state that due to the high electricity prices in 2022, the number of members has increased, and interest in participation has generally risen (see Figure 2). Besides ecological and economic benefits, RECs create social benefits. In the analysis, 86% of the REC respondents contribute to combating energy poverty, e.g., by offering stable tariffs or benefits for households at risk of poverty. The analysis shows that most RECs are forward-oriented, considering their future plans. Plans of the RECs primarily include PV expansions, the admission of new members with PV systems, and other expansions through storage and sector coupling. In addition to that, some RECS consider heat to be an additional form of energy. The analysis identified opportunities and barriers for energy communities, with missing consumers, incomplete data from the EDA portal, and billing challenges among the barriers and planned multiple participation and expansion plans through sector coupling among the opportunities.

The evaluation of the measurement data from four RECs confirms that the different structure of total generation and total consumption impacts the indicators and the success of the energy community. Figure 3 shows the degree of self-sufficiency of the four energy communities, A, B, C, and D, relative to the installed capacity. With a 30 kWp PV system, REC A achieves a self-sufficiency of 18% per year, whereas REC B, with a 20 kWp PV system and storage, achieves a degree of self-sufficiency of 30%. Due to its continuous energy generation of 90 kW, the hydroelectric power plant nearly meets all of its energy consumption, achieving a self-sufficiency rate of 97%. REC D has a 181 kWp PV-system. However, due to high total consumption, the degree of self-sufficiency is 43%.

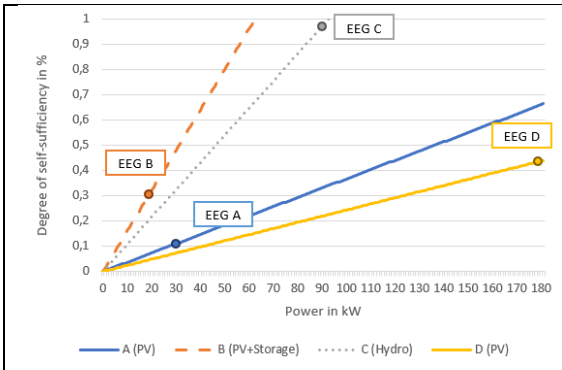

Fig. 3: The degree of self-sufficiency of REC A, B, C, D as a function of the installed capacity.

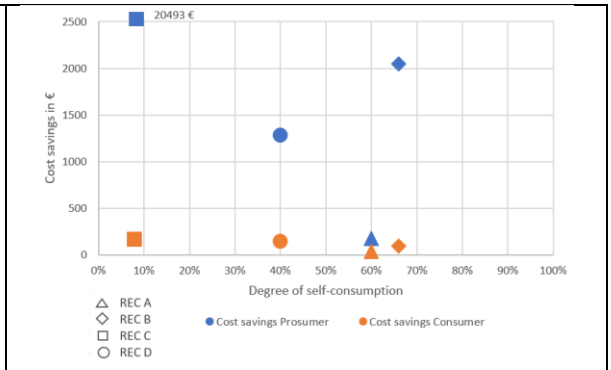

Fig. 4: Saved costs of producers and consumers of REC A, B, C, D depending on the degree of self-consumption.

Besides the degree of self-sufficiency, the saved costs of prosumers and consumers of the respective REC A, B, C, and D and the degree of self-consumption have been assessed (see Figure 4). REC A consumes a large amount of the generated energy directly on-site, considering a self-consumption rate of 60%. The REC B storage system enables more efficient use of the electricity generated, which means that less available electricity can be distributed to the grid and, if required, to the RECs. At € 2045, the cost savings for the prosumers are significantly higher compared to REC A and D. Although REC C is almost entirely independent of external energy sources, the low self-consumption rate of 8% shows that most of the generated electricity is fed into the public grid.

Conclusions

The evaluations of Austrian RECs show that each REC must be considered individually due to the different consumption and generation structures. The results have shown that environmental and economic benefits are associated with any form of REC. Most respondents consider RECs a successful model but see room for improvement, particularly in cooperation with grid operators and transparent registration processes for members. There is a significant correlation between the amount of locally used energy generated within the community and the quality of the indicator values.

References

[1] E-Control „EAG Monitoring-Bericht 2023“ E-Control, 2023. [Online]. Availabe: EC_EAG_Monitoringb23_20.09.indd (e-control.at). [Accessed on 11/16/2023]