Energy communities: comparing the implementation of EU directives and initiatives (Angel Alcalde, Filip Dümont)

1. Introduction

- **Background & Relevance of the Topic**

The global energy landscape is currently undergoing a major transformation as countries across the globe move towards decentralised and community-led sustainable energy solutions. Energy communities have emerged as a primary mechanism to promote local energy production, liberalise energy access and, above all, improve energy efficiency. These communities are becoming popular within the broader European Union strategy to achieve both energy and climate objectives, by exclusively reducing dependence on fossil fuels and encouraging citizen participation in the energy sector.

- **What are *Energy Communities (ECs)* and why are they important?**

Energy communities represent collective energy initiatives where small businesses, citizens, municipalities and other local actors come together to distribute, generate and sometimes soul renewable energy. The basic principle of these communities is that the way of generating and managing energy should be directed at a local level offering social, environmental and economic advantages to its members and their community.
Some of its advantages are the following:
Ecological sustainability: energy communities have as their main focus renewable energy sources such as solar, wind and biomass, reducing carbon dioxide emissions.
Decentralization of energy generation: by producing energy at a local level, these communities reduce the dependence on centralized electricity networks.
Financial empowerment: the distribution of income enables these communities to obtain economic benefits from the energy transition.

- **The role of ECs in the EU's energy transition goals.**

The European Union has set ambitious goals to achieve climate neutrality by 2025, and today it has intermediate goals such as reducing greenhouse gas emissions by at least 55% by 2030 (compared to 1990 levels). The European communities are important because they have a key role to play in achieving these goals by accelerating the implementation of renewable energies and improving local energy security.

To support the CES, the EU has adopted legal structures, in particular through the Clean Energy for Europeans package, which covers:

- Recognising and supporting renewable energy communities in achieving EU climate goals.
- Setting rules for energy users, ensuring that everyone has a fair chance to use the energy grid.
- The CES encourages community participation and enables residents to manage their energy infrastructure, promoting a fairer and greener energy transition.As EU countries adopt these regulations, differences in national legal systems and methods underline the difficulties and prospects in advancing the CES across Europe.
- This project seeks to examine the implementation of EU energy directives by energy cooperatives, counter the various national strategies, and assess their success in advancing EU energy transition goals.

- **Research Question & Objectives**
    - **How has Austria implemented EU directives related to ECs?**

How has Austria implemented the EU directives related to the CES?

Austria has been a pioneer in adopting the EU directives on energy cooperatives, fostering a supportive legal environment for their growth. With the change of the Renewable Energy Directive (Network II) and the Internal Electricity Market Directive (EMD), Austria has implemented particular rules to support the creation and operation of the CES.

- Austrian laws allow individuals, businesses and cities to help create and share clean energy.
- Grant and fee support programmes have been put in place to encourage investments in community energy infrastructure.
- Austria has chosen to use technology to make things smarter and better to get things done faster.

    - **How does Austria's approach compare to other EU member states?**

How does Austria's approach compare to other EU Member States?
The implementation of the CES varies considerably between EU countries due to discrepancies in legislative structures, tax motivations and pre-existing facilities.
While it has also made progress in regulating CES, its approach puts more emphasis on large energy companies and market decentralisation.
Spain has introduced more recent regulations, but still faces challenges in simplifying administrative procedures and accessing finance.
France has a centralised system where CES works with grid operators.
Examining these distinctions will allow for the assessment of optimal methods and the formulation of proposals to improve the implementation of energy collectives across the European Union.

- **Methodology & Structure of the Paper**
    - **Overview of the research methods used (policy analysis, case studies, comparison).**

This research employs a qualitative methodology, focusing on policy examination, case studies and cross-national comparisons. Initially, a review of EU directives and national legislation in Austria and other Member States is carried out to understand the local implementation of these regulations. Then, Austria and Czech Republic energy communities are examined, allowing for the assessment of their real-world applications and the obstacles encountered.

2. Theoretical & Regulatory Framework

- **Methodology**

Within the methodology of this paper, the implementation of the European Renewable Energy Directive II (RED II) will be examined, focusing specifically on community energy initiatives in the Czech Republic and Austria. The analysis will concentrate on identifying economic, legislative, and social factors influencing the implementation of RED II and the development of Renewable Energy Communities (RECs) in both countries, utilizing factors previously identified by Spasova and Braungardt (2021). This document-based approach will facilitate a systematic comparative analysis to identify similarities, differences, and best practices in both countries.

- **Analysis of RED II**

Directive (EU) 2018/2001 (RED II) places considerable emphasis on fostering Renewable Energy Communities (RECs) to enhance citizen participation, democratize energy markets, and accelerate Europe's energy transition (Directive (EU) 2018/2001, 2018). RECs are seen as instrumental in achieving sustainable energy goals, promoting local energy solutions, and encouraging citizen involvement in renewable energy initiatives (Directive (EU) 2018/2001, 2018).

RECs are empowered to generate, consume, store, and sell renewable energy, including through renewable power purchase agreements (PPAs), and are allowed to share renewable energy produced by facilities owned by the community itself. Furthermore, they can enter electricity markets directly or through aggregation without discrimination.

Member States must assess current barriers and the potential for developing RECs within their jurisdictions and create supportive frameworks that address these barriers (Directive (EU) 2018/2001, 2018). These frameworks must ensure fair, transparent, and streamlined licensing and registration processes, as well as equitable network fees, charges, and taxes reflective of actual costs and benefits (Directive (EU) 2018/2001, 2018).

Additionally, RED II emphasizes equitable treatment of RECs, ensuring non-discriminatory access to markets and fair distribution of system costs. It also stresses the need to provide access to participation for all consumers, including those in vulnerable or low-income households. Member States are required to facilitate REC access to financial resources and relevant information, provide regulatory and capacity-building support to public authorities involved in REC activities, and enhance access for vulnerable or low-income households (Directive (EU) 2018/2001, 2018).

- **Definition and Concept of Energy Communities**

The role of Energy Communities (ECs) within the European Union's energy transition strategy is increasingly significant. Recognizing this potential, the revised EU Renewable Energy Directive (RED II) (Directive (EU) 2018/2001, OJ L 328, 21.12.2018, pp. 82–209) explicitly emphasizes the importance of Renewable Energy Communities (RECs) as key contributors to Europe's decarbonization objectives. By formally defining RECs, RED II provides a clear legislative basis

and underscores their potential to foster citizen participation, enhance local renewable energy generation, and democratize the energy market. Article 22 of RED II specifically mandates Member States to incorporate a precise legal definition and establish supportive frameworks to encourage the development and operation of RECs. Consequently, all EU Member States were required to transpose these provisions into their national legislation and adopt appropriate enabling policies for renewable energy communities by the end of June 2021, thereby advancing the EU's overarching climate neutrality and renewable energy ambitions (Spasova & Braungardt, 2021).

- **The Role of Social Cohesion in the Development of Energy Communities**

The importance of social cohesion for the emergence and development of energy communities is supported by a quantitative study by Lode et al. (2022), which analyzes the spatial distribution of energy cooperatives (ECoops) in EU countries and their correlation with socio-demographic indicators. The findings indicate that ECoops are more likely to emerge in regions with higher levels of social progress and quality of life—particularly where lifelong learning is well developed, trust in institutions is strong, access to information is widespread, and housing satisfaction is high. The most significant correlation was identified with the lifelong learning indicator, which showed the highest predictive value ($R^2 = 0.343$). The study also revealed spatial clusters of ECoops, especially in Northern and Western Europe, whereas Eastern and Southeastern regions show a lower prevalence of such initiatives. These insights confirm that the successful implementation of energy communities depends not only on legal and regulatory frameworks but also on local social structures and civic engagement. Incorporating these factors into national policy design can enhance the effectiveness of the RED II directive's transposition and support a more equitable development of community energy across the EU.

3 Energy Communities in Austria and Czech Republic

3.1. Austria

Legislative Framework and National Policies

The European Union (EU)s efforts to reshape its energy sector have advanced notably through the introduction of Energy Communities (RECs) which play a crucial role in fostering decentralized and eco friendly energy infrastructures.In this segment of the discussion t he focus shifts to examining the EU regulations regarding RECs the measures taken by Austria and a comparison, with other EU countries to highlight both the distinct and common hurdles encountered during this shift.

The European Union has implemented guidelines that offer a structure for setting up and managing Renewable Energy Communities efficiently and effectively within the Clean Energy Package (CEP). These directives encompass the Renewable Energy Directive II (RED II) along with the Electricity Market Directive (EMD) with a goal of enabling individuals and community groups to play a significant role, in transitioning to renewable energy sources (Biresseliouglu et al. 2021). The purposes of these guidelines are diverse and multifaceted. Their goal is to make energy production and usage more accessible to everyone while also improving energy security and cutting down on greenhouse gas emissions through promoting energy innovation initiatives. These guidelines encourage individuals to take a role in the energy sector by aiming to distribute energy systems more evenly; a departure from the usual reliance on centralized power plants, for large scale energy generation.

RED II focuses heavily on the importance of Energy Communities (RECs) in meeting the European Unions renewable energy goals by defining RECs as legal entities that facilitate the collaborative management of energy generation and distribution for the local communitys benefit. The directive outlines responsibilities and privileges for RECs to ensure fair treatment without discrimination in relation to other participants, in the market. Furthermore RED II promotes the adoption of renewable energy sources like wind power, solar energy and biomass, within these localities.

Image 1: Integration of Energy Storage in Renewable Energy Communities

Source: Österreichische Koordinationsstelle für Energiegemeinschaften (2023)

Austria has taken steps to harmonize its domestic laws with the EU guidelines, on Renewable Energy Communities (RECs). By incorporating the regulations outlined in RED II and EMD into its system as highlighted by Fina & Fechner (2021) the country has made it easier for RECs to be established and operated within its borders. The process of implementing these directives into legislation has entailed modifying current energy statutes and enacting fresh rules that focus on the creation and supervision of energy communities.

Austria stands out for its focus on giving communities the freedom to make decisions. Involve the local residents in energy projects planning and execution process unlike other countries approaches to renewable energy initiatives according to recent research (Fina et al. 2021). This strategy has encouraged creativity and trial and error in developing and rolling out Renewable Energy Communities (RECs) establishing Austria as a frontrunner in this field of work; nonetheless it also poses difficulties such as supervision issues and ensuring alignment, with national energy objectives.

Despite trying to do so Austria encounters various difficulties in completely executing the directives of the EU.These obstacles consist of technical and financial hurdles and opposition from conventional energy suppliers who might perceive RECs as a challenge to their dominance, in the market.In addition some worries exist regarding the load placed on small communities.They may not have the means and know how to maneuver through the intricate regulatory setting.

The way EU directives on RECs are put into action differs greatly among member states due to variations in their focuses and approaches to legal frameworks and energy markets. Austrias strategy stands out compared to countries such, as Germany and France that have also played leading roles in advocating for RECs.

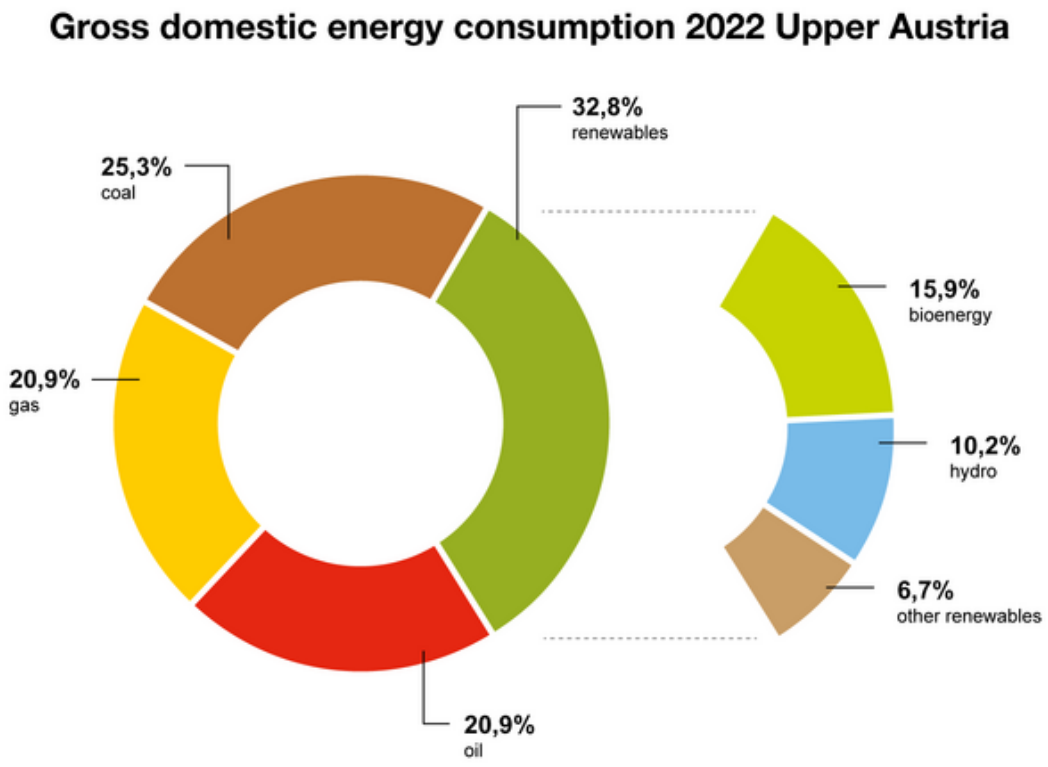
In Germany as an example. The focus has been on incorporating Renewable Energy Certificates (RECs) into the energy transition plan known as Energiewende.This approach includes financial backing and policy incentives to encourage renewable energy projects led by communities.The case of Germany underscores the significance of tools and public backing, in addressing hurdles to REC advancement.

In contrast to countries, like Austria mentioned by Azarova et al. in 2019 France has adopted a centralized strategy where the government actively participates in organizing and endorsing REC initiatives to ensure a systematic and uniform application of EU directives despite potentially constraining flexibility and creativity.

When looking at it comparatively the decentralized and community centered strategy of Austria provides insights for other nations aiming to harmonize local independence, with national energy objectives. Nonetheless it also highlights the importance of support networks to assist communities in addressing the technical and financial obstacles linked with REC advancement.

Recent research data suggests that incorporating Renewable Energy Certificates (RECs) can bring about advantages in terms of economy preservation and environmental and societal well being. These advantages encompass lowered energy expenses. Boosted local job opportunities as well as improved community strength against challenges.However the prosperity of RECs hinges on aspects, like the existence of monetary encouragements the governing framework and the extent of community part

Image 2: Gross Domestic Energy Consumption Mix in Upper Austria, 2022



Source: https://www.energiesparverband.at/en/energy-in-upper-austria/energy-strategy

The theoretical foundation of Renewable Energy Credits (RECs) is rooted in the ideals of energy democracy and social innovation.Energy democracy highlights the importance of citizen and community involvement in shaping energy systems by advocating for transparency and inclusivity.Social innovation focuses on creating social norms and organizational structures to tackle societal issues and enhance overall well being.

In summary Austrias efforts to follow EU guidelines regarding Renewable Energy Certificates demonstrate a dedication to supporting communities and promoting sustainable energy infrastructures. Despite facing obstacles that need attention Austrias journey provides lessons for other nations aiming to leverage RECs, in transitioning towards cleaner energy sources. By endorsing creativity and teamwork Austria has the potential to take a forefront position in shaping a greener and fairer energy landscape for the future.

Economic Factors Influencing REC Development

The establishment of Energy Communities (RECs) in Austria is significantly influenced by different economic elements that play a key role in assessing the success of RECs in aiding Austria's energy transition objectives. This segment will explore the motivations and economic structures that facilitate REC growth, examine the pros and cons from both community and investor viewpoints, and assess the economic challenges that impede the expansion and durability of RECs in Austria.

In Austria, REC progress is influenced by a variety of benefits and financial structures in place to support it effectively for interested communities and investors keen to establish RECs. The government offers subsidies and tax breaks as incentives to facilitate renewable energy project establishment by significantly decreasing the initial capital needed.

Austria, as well as other similar countries, has welcomed public-private partnerships (PPPs) as a way to support the growth of Renewable Energy Certificates (RECs). These partnerships involve sharing both risks and resources between government bodies and private investors. The government offers financial support or incentives, while private companies contribute expertise and funding. This collaboration can accelerate the advancement of energy technologies and necessary infrastructure development, creating a more favorable environment for RECs to thrive.

Assessing energy projects from a community standpoint involves considering key aspects such as upfront expenses, future savings potential, and possible income sources. The initial capital needed for establishing energy systems can be substantial and may pose challenges for communities with limited financial resources. Nevertheless, the long-term benefits in terms of reduced energy costs are considerable, as it allows communities to generate their own power and reduce dependence on traditional energy suppliers.

Investors often find REC projects appealing due to the revenue sources they offer. These projects can generate profits by selling energy to the grid and benefiting from government incentives for renewable energy production. Moreover, the increasing demand for energy credits presents another opportunity for revenue generation, as businesses and individuals strive to reduce their carbon footprint by investing in renewable energy credits.

Although there are advantages and rewards to consider, there are numerous economic obstacles that can hinder the expansion and longevity of RECs in Austria. A notable impediment is the restriction of funds. Obtaining capital can be a challenge for local communities and small investors aiming to create RECs. While financial support and incentives may offer assistance, they might

not be adequate to finance the development process, leaving communities in need of additional funding sources.

Another challenge is market access. Large energy providers dominate the Austrian energy market, which hinders smaller community-based projects from competing effectively. This limits their ability to sell excess energy or obtain favorable terms, affecting their financial viability.

In addition, regulatory barriers present significant challenges. Navigating complex regulatory environments can be overwhelming for communities lacking technical expertise or resources. Meeting regulatory obligations, such as obtaining permits and adhering to technical standards, increases setup costs and adds complexity, discouraging potential REC developers).

To overcome these obstacles, various strategies could be utilized. One key aspect is improving access to funding, which may include expanding government grant programs or developing financial tools specifically tailored for supporting REC endeavors. Collaborations with financial institutions to offer favorable loan conditions could also assist communities in overcoming initial financial barriers.

Enhancing the accessibility of RECs can also be achieved through policy changes that promote fair competition and support small-scale renewable energy providers. This could involve updating grid access regulations to prioritize renewables or creating market mechanisms that recognize the ecological and societal benefits of community-driven energy generation.

In conclusion, simplifying the regulatory framework and offering technical support to communities can effectively address regulatory obstacles. Establishing clear instructions and streamlining processes can reduce the burden on renewable energy developers, helping them better manage legal and technical requirements.

The economic factors that impact the development of RECs in Austria are complex and multifaceted. While financial incentives and funding models support REC initiatives, key challenges remain—particularly regarding funding limitations, market access, and regulatory complexity. Implementing targeted strategies to overcome these barriers can foster the growth and long-term success of RECs, aligning with Austria's broader goals for a sustainable energy transition. By leveraging economic incentives and addressing existing challenges, Austria can further its leadership in sustainable energy and promote a renewable energy future that is both environmentally responsible and community-centered.

Historical Context and Community Engagement

The energy community idea in Austria has its roots firmly planted in the nation's long history of cooperative movements that date back to the early 20th century. The movements were originally established to give power to local communities by making them in charge of resources through communal and democratic management. This grassroots initiative paved the way for building energy communities by enhancing local involvement and responsibility for and ownership of common assets. The energy community model appeals to such historical precursors in so far as it facilitates involvement in energy production and control at the local level and thereby enhances local sustainability and resilience.

In the European context, energy communities have made significant strides with the introduction of the Renewable Energy Directive II (RED II) and the Electricity Market Directive (EMD), two elements of the Clean Energy for All Europeans Package (CEP). These directives aim to support the transition to renewable energy sources by empowering community groups at a local level to generate, consume, and export renewable energy. They provide a legal structure that supports the establishment of Renewable Energy Communities (RECs), which are legal entities on the basis of open and voluntary membership, self-management decision-making, and de facto control by shareholders or members who are located in the area surrounding the renewable energy projects they own and build (Biresselioglu et al., 2021).

Austria has also led the way in harmonizing national policies according to these EU directives and has implemented legislation to promote the establishment and operation of energy communities. Austria brought in a series of policies directed towards the promotion of RECs, such as the Renewable Expansion Act that focuses on an increase in the use of renewable power in the country's energy mix. This legislation provides a supportive framework for the formation of energy communities by means of incentives such as subsidies and tax breaks to encourage local participation in renewable energy projects (Fina & Fechner, 2021).

Public awareness campaigns and education have played a crucial role in shaping community attitudes and participation in RECs. Such campaigns aim at creating public awareness about the benefits of renewable energy and the necessity to transition towards a sustainable energy system. Raising awareness and understanding about energy communities, these campaigns aid in constructing public trust and acceptance among the locals, which is essential to guaranteeing the successful implementation of REC projects (Fina et al., 2021). Educational activities often

incorporate coordination between government organizations, non-government organizations, and local community organizations to provide the information for use by the target group.

Efficient examples of community involvement and participation in REC projects in Austria highlight the importance of involving local stakeholders within the planning and decision stage. One such example is the Bürgerkraftwerk project, which is a Vienna-based community-owned solar energy power station. This project was conceptualized through participatory design whereby residents were made part of the design and implementation process, promoting a community-owned and pride-based sense among the local residents (Fina & Auer, 2020). The Bürgerkraftwerk model depicts how effective involvement in local matters can lead to the implementation of renewable energy schemes that benefit both the local economy and the environment.

Another fascinating example is the E-Carus project in the Carinthia region, which deals with integrating electric mobility and renewable energy production. The project was developed through collaboration between research institutions, energy providers, and local municipalities, highlighting the importance of cooperation in achieving sustainable energy goals. The E-Carus project has worked well at stimulating the deployment of electric cars powered from locally produced renewable energy, demonstrating the power of energy communities to drive innovation and sustainability at a local level.

These accomplishments notwithstanding, there continues to exist challenges that must be addressed in order to garner local acceptance of RECs. One of those challenges is opposition by local communities, typically referred to as NIMBYism (Not In My Backyard). Resistance is caused by a variety of reasons that include fear of changing the local environment, noise, and the potential for negative impacts on property values. To counter such fears, project developers must engage local communities at the planning stage and provide open and clear information on the possible impacts and benefits of REC projects.

Methods of developing local support and increasing social acceptance of RECs in Austria include establishing trust within institutions at a local level, emphasizing the environmental and economic benefits of renewable energy, and allowing people in the community to contribute to the decision-making process. Creating strong relations between project developers, government, and citizens can also introduce the unity of purpose spirit and commitment of all towards achieving sustainable energy results. Providing opportunities to residents to hold interests in REC schemes can enhance a sense of community participation and engagement, further increasing approval and adoption.

In short, the historical evolution of Austrian energy communities is interrelated with Austria's cooperative movement, which has created a platform for RECs' formation. Sensitization of the public and campaigns have contributed significantly towards people's attitude change and participation at the community level, and successful case studies highlight the need for community participation and acceptance. Despite challenges such as NIMBYism, efforts towards encouraging local support and increasing social acceptance of RECs are necessary for the effective implementation of such projects in Austria. By developing cooperation and confidence among stakeholders, energy communities have a significant role to play in Austria's future direction towards a sustainable energy path.

Local Acceptance and Social Support

Social acceptance is one of the most important factors in the successful implementation of Renewable Energy Communities (RECs). Several factors play an influential role in the social acceptance of the projects in Austria. To begin with, trust in local institutions is vital. Trust is based on transparency, credibility, and the ability of institutions to manage and communicate renewable energy projects efficiently. If people in communities think that their best interests are being considered by local institutions, then they will be more likely to embrace REC projects. Azarova, Cohen, Friedl, and Reichl (2019) highlight how infrastructure like farms and power-to-gas systems enable the social acceptance of energy communities, with the implication that material and visible benefits ease trust and acceptance.

Perceived benefits of RECs also have an essential role to play in social acceptance. Such benefits include economic advantages such as reduced energy costs, increased rates of employment, and local economic stimulus. Additionally, environmental benefits such as reduced carbon emissions and improved air quality are also acceptance determinants. Vogler and Wittmayer (2024) cite the rapid development of energy communities in Austria and their inherent contribution to Austria's energy transition, pointing out that perceived benefits are necessary for acceptance. People will more easily support projects with clear advantages to their community.

Environmental awareness also plays a role in social acceptance. As there is greater awareness of climate change and environmental issues, communities become more receptive to renewable energy options. Seidl, von Wirth, and Krütli (2019) point to the role of Distributed Energy Systems (DES) in facilitating energy transitions in countries, for instance in Austria, citing the importance

of environmental awareness in fostering acceptance. Societies that prioritize environmental sustainability will most likely be more receptive to RECs.

Despite the benefits, it is not simple to obtain local acceptance for RECs due to numerous factors of social resistance. One of the most prevalent is NIMBYism (Not In My Backyard), where individuals support renewable energy projects but are against their development in close proximity to their homes. The resistance is founded on issues of property devaluation, changes to local landscapes, and disruption during the development process. Scherhaufer, Höltinger, and Salak (2017) speak about patterns of acceptance and non-acceptance in the wind energy industry in Austria, explaining that NIMBYism can be an obstacle to project realization.

Additionally, social resistance can be brought about by ignorance or misinformation about RECs. When communities are poorly informed about the benefits and processes of renewable energy projects, resistance and skepticism can intensify. Friedl and Reichl (2016) discuss issues related to energy infrastructure projects in Upper Austria, stressing the importance of clearing up misinformation to dissolve resistance.

There are, moreover, societal and cultural matters affecting acceptance. Societal dedication to traditional energy sources and distrust of novel technology may create barriers. Von Wirth, Gislason, and Seidl (2018) speak about the role of incumbent energy actors in socially accepting novel energy technologies, implying that cultural dimensions must be considered while promoting RECs.

In order to overcome these barriers, strategic initiatives must be implemented to enhance local support and increase the social acceptance of RECs in Austria. One viable strategy is encouraging community buy-in through participatory measures. Involving members of the community in planning, decision-making, and implementation of RECs has been found to increase ownership and acceptance. Scherhaufer et al. (2017) argue that communities can be involved through workshops, forums, and education campaigns to demystify renewable energy projects and reduce resistance.

Public education and awareness are imperative in building understanding and acceptance. Awareness creation of the benefits, processes, and technologies behind RECs has the potential to demystify misconceptions and build trust. Hofer (2024) discusses the Austrian REC landscape and points out information dissemination by the Austrian Agency for Energy Communities as being

necessary for fostering acceptance. Awareness creation could entail informational brochures, local events, and media stories in order to reach a large number of people.

NIMBYism has to be addressed by specific policies targeted at dealing with the anxieties and negotiating trade-offs. Offering incentives to the local populations, such as tax benefits, community funds, or development programs, can water down opposition. Friedl and Reichl (2016) highlight the importance of dealing with local anxieties and negotiating advantages to achieve wider acceptance.

Building partnerships with local stakeholders, such as businesses, schools, and community organizations, can also consolidate support. Collaborating on efforts can create a sense of two-way benefit and responsibility, generating acceptance. Schumacher et al. (2019) point to the link between public acceptance and community energy autonomy, with partnerships fostering sensations of empowerment and stake in the energy future of the community.

In conclusion, while there are challenges in achieving local acceptance and gaining more social acceptance of RECs in Austria, there are measures that can be employed to overcome these barriers. Institutional trust, perceived benefits, and environmental concern are the most influential drivers of acceptance. NIMBYism, limited information, and cultural resistance can be addressed by community engagement, education, and collaboration to establish more local acceptance. By employing these measures, Austria can move forward with its ambitions in renewable energy and realize sustainable and socially accepted energy communities.

Identified Drivers and Barriers

The development of Renewable Energy Communities (RECs) in Austria is influenced by a complex interplay of drivers and inhibitors. Some of the major drivers and inhibitors include technological innovation, policy incentives, environmental goals, regulatory challenges, technological obstacles, and stakeholder opposition. Understanding these dynamics is crucial to making a contribution to the development and sustainability of RECs in the Austrian energy market. The following section will address the most significant drivers and inhibitors with an in-depth analysis based on recent reports and studies.

Technological innovations are central to driving the development of RECs. In Austria, technological advancements in renewable energy technologies such as solar photovoltaics and wind power have made it feasible for communities to generate, store, and provide clean energy

efficiently. Smart grids and internet platforms also enhance energy system management and optimization, facilitating easier scaling up of RECs. The application of such technologies not only reduces the consumption of fossil fuels but also empowers communities by decentralizing energy production and consumption.

Smart grid technology, for instance, enables real-time monitoring and management of the flow of energy, which is critical in balancing supply and demand in a network of communities. Such technology makes it possible for communities to integrate renewable energy sources seamlessly, manage peak loads, and reduce energy wastage, thus making RECs more viable and appealing. Also, developments in energy storage technologies, such as battery technologies, make REC operations more stable and reliable through the elimination of intermittency-related difficulties of renewable energy sources.

Austria has implemented various policy initiatives to support REC development based on EU guidelines. The policies include subsidies for renewable energy projects, tax advantages, and regulatory frameworks enabling the establishment and operation of RECs. The government has heavily promoted RECs as a means of achieving national energy transition goals, reducing carbon emissions, and enhancing energy security.

EU directives bear significant influence on the development of the country's national policies through provision of guidance and objectives for renewable energy utilization. The Renewable Energy Directive, for example, is accompanied by ambitious targets to increase the share of renewable energy in the overall energy mix to encourage the utilization of support measures for RECs. Adherence to these directives by Austria is witnessed through its legislative efforts, which aim at putting in place an effective environment for the spread of RECs.

Environmental consciousness is a powerful driver of REC expansion. Austria's climate change and environmental protection efforts are reflected in public discussion and energy policy. RECs mitigate greenhouse gas emissions, promote energy conservation, and enhance biodiversity by replacing fossil fuel-based energy with renewable energy sources. The drive for environmental goals motivates communities to adopt renewable energy technologies and take an active role in the energy transition.

Public campaigns that have raised awareness of the environmental benefits of RECs have also helped to boost community participation and acceptance. By championing the positive impact of

RECs on the environment, public campaigns instill a sense of public good in supporting a move to cleaner energy and thus encouraging the adoption of RECs across Austria.

Despite the supportive policy environment, regulatory challenges could discourage the progress of REC development. Complex regulatory procedures, permitting difficulties, and bureaucratic challenges prolong the implementation of projects and increase costs. It is time-consuming and resource-intensive to deal with the regulatory framework, potentially burdensome for capacity-constrained community-based projects.

Harmonization of EU directives with the national law is crucial in solving such barriers. Discrepancies between EU guidelines and national implementation, however, can introduce uncertainty and hold up REC development. For instance, discrepancies in grid access regulations, tariff schemes, and licensing schemes can pose a problem to communities that intend to develop RECs.

While technological advancement is responsible for REC development, certain technical challenges can act as dampeners. Renewable sources of energy can be technically challenging when they are integrated into pre-established grid systems with the requirement for upgrading and realignment to make them compatible and safe. The variability of renewable sources of energy such as solar and wind implies the use of an efficient energy storage facility to provide consistent energy supply.

The cost and availability of newer technologies can also be beyond the reach of other communities. High initial investment costs for renewable energy systems, smart grids, and storage solutions could deter community involvement, especially for financially constrained communities. Overcoming these technological barriers requires targeted support and incentives to reduce costs and enhance accessibility in all communities.

Stakeholder resistance is the other key challenge to REC development. Resistance by incumbent energy utilities, local authorities, and even locals may hamper REC projects. Fears of energy market changes, losses of revenues for traditional generators, and economic dislocation to the local economy may create resistance by interest groups entrenched in place.

Resistance at the community level, such as NIMBYism (Not In My Backyard), can also hold back REC projects. Despite the environmental and economic benefits, people might resist renewable energy projects due to perceived negative impacts on property values, aesthetic appeal, or local

environments. Overcoming stakeholder resistance requires effective communication, transparent engagement processes, and attention to highlighting actual benefits of RECs to local communities. To give a better idea of the drivers and barriers to REC development in Austria, tables and graphs can be used to show the data in graphical form. These visualizations can show trends, highlight key factors, and supplement the analysis with empirical facts based on recent reports and studies.

3.2. Czech Republic

In the Czech Republic, the Energy Data Center (EDC) was established to manage an electricity-sharing system among citizens and organizations starting in 2024. By the end of 2024, over 13,000 participants had joined the system, collectively sharing over 1,059 MWh of electricity throughout the year. Energy communities have gradually become established, with approximately twenty communities registered by the end of 2024. The largest participant groups consisted of active customers and apartment buildings, but businesses and public administration entities also started actively participating in electricity sharing (EDC, 2025).

Allocation rules and administrative procedure

Under the current Czech legislation, electricity can be allocated among the members of a sharing group only by a simple static method (Unie komunitní energetiky [UKEN], 2024). Concretely, each member pre-defines a percentage share, and every 15 minutes the electricity produced by the group's generators is split among the metering points according to those percentages; the sum for each generator must not exceed 100 % (UKEN, 2024).

This static approach creates a major barrier to efficient local consumption: during any 15-minute interval some members may take less than their allocated share while others could have used more, so the unused kilowatt-hours fall into the public grid without the community discount.

The restriction persists because Lex OZE II laid down only the basic legal framework and left the detailed allocation methodology to a future implementing decree, which still does not include dynamic or hybrid methods (UKEN, 2024). A further limitation is that one metering point (EAN) may belong to only one sharing group (Zákony pro lidi, 2023), preventing a household from drawing simultaneously from two complementary local sources.

Despite these technical constraints, the amended Energy Act tries to keep the administrative side simple. Anyone wishing to join a sharing group must complete only a few steps (Zákony pro lidi, 2023):

- Active customers (individuals or informal groups of up to ten non-apartment members) do not need legal personality. They simply register their group online in the portal (EDC-CR.cz). Registration is free and requires only the EAN codes of the metering points (Elektroenergetické datové centrum, 2024; Ministerstvo průmyslu a obchodu , 2024). The digital registration system has been fully operational since 1 August 2024.

- Energy communities (larger projects) must establish a legal entity—usually an association or an energy cooperative—and obtain registration by the Energy Regulatory Office (ERÚ). ERÚ verifies the 10 % cap on voting rights per member and the rule that no more than one third of the profit may be distributed to members. After registration with ERÚ, each community still records its concrete sharing groups in the (EDC, 2024).

Geographically, a sharing group may encompass generators and consumers only within three contiguous municipalities with extended powers (ORP) or, in the case of Prague, within the capital as a whole. During the transition period the group size is capped at 1 000 members, but the Ministry has announced that the cap will disappear in 2026 (MPO, 2024).

- **Active Customer vs. Energy Community**

In the field of electricity sharing, there are specific conditions and rules that differ depending on whether it involves an active customer or an energy community. These differences include aspects such as territorial scope, the size of the sharing group, methods of electricity distribution, and the possibility of combining different types of sharing. For better clarity and comparison of these aspects, a summary of all the key differences between these two models will be provided in the following table, allowing for a clearer understanding of their specifics and conditions.

Table 1: Key Regulatory Differences Between Active Customers and Energy Communities in Czech Electricity Sharing

	Active Customer	Energy Community

Territorial Scope of Sharing	Entire Czech Republic	Territory of three contiguous ORPs or the territory of the capital city of Prague
Maximum Size of the Electricity Sharing Group (SSE)	11 EAN	1000 EAN
EAN Involvement in Sharing Groups	Each EAN can only be assigned to one sharing group. Sharing groups cannot share electricity between each other	
Electricity Distribution Method	Multi-stage static method with five repetitions	Multi-stage static method with five repetitions for SSE size <50 EAN; for SSE >50 EAN, single-stage static method
Combination of Sharing Without and With Distribution Network Usage Within One SSE	In one sharing group, it is not possible to combine electricity sharing without the use of a distribution network (e.g., residential building) and with the use of a distribution network (active customer or energy community).	
Limit on the Number of Power Plants Sharing to One Consumption Point	Electricity can be shared from a maximum of five power plants to one consumption point.	
Possibility of Charging for Shared Electricity	Shared electricity can be provided for a fee based on an agreement between members of the sharing group.	

Source: (Frank Bold, 2025)

- Legislative framework and national policies.

Sharing elektricity in Czech Republic is currently governed by four key documents. These are:

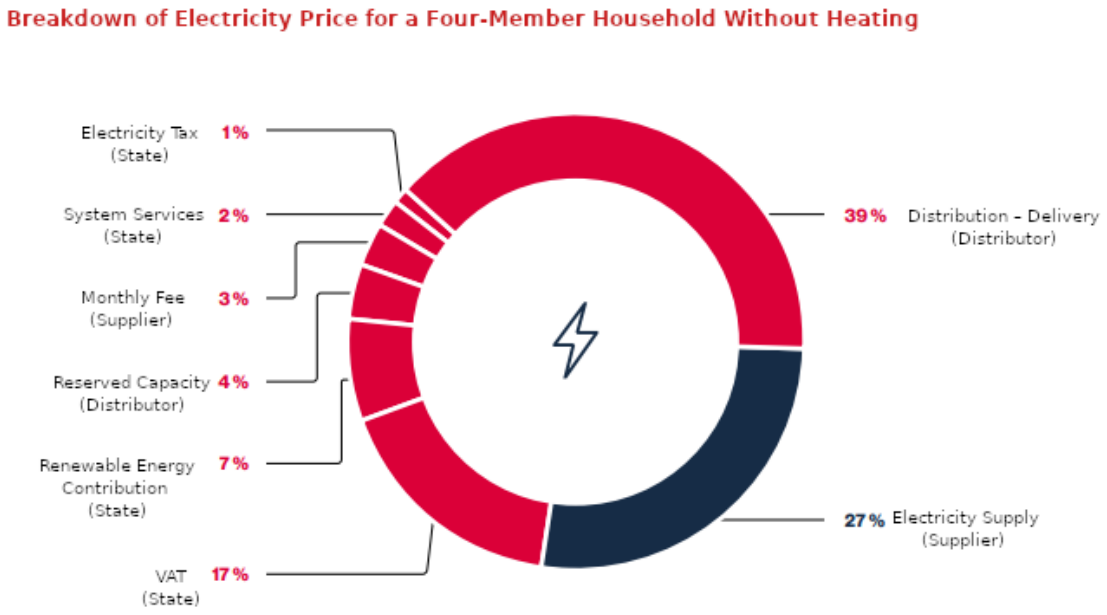
1. Lex OZE II – the amendment to the Energy Act defines new entities, sharing groups, and EDC (Energy Data Centers), and allows energy sharing within the distribution network.
2. Electricity Market Rules: Decree No. 408/2015 Coll., on electricity market rules – specifies types of sharing groups, processes, deadlines, and criteria related to registration in the EDC. It also describes allocations and sharing of information about the delivered or consumed commodity.
3. Decree No. 540/2005 Coll., on the quality of electricity supply and related services in the electricity sector – regulates the application of compensations related to the quality of supply and related services.
4. Regulations of the Electricity Data Center – a set of rules and technical specifications that govern the structure and functioning of the EDC.

This amendment to the Energy Act, Lex OZE II, was created based on the European directive Renewable Energy Directive (EU) 2018/2001, also known as RED II, and was supposed to be applied as of 2021. However, the law will only be effective from the beginning of 2024. Among other things, it addresses energy communities in several aspects: the definition of energy communities, practical implementation of electricity sharing, and the definition of the rights and obligations of energy communities.

- Economic factors influencing REC development.

Electricity sharing allows electricity to be generated at one location and consumed at another, with the process being an accounting operation where the same electricity produced is not physically consumed. Consumption must occur within the same fifteen-minute interval in which the electricity is generated. The regulated portion of the electricity price, which includes charges for distribution, renewable energy, the consumption point, and others, must be paid both for shared electricity and for electricity supplied by the trader. Electricity sharing is evaluated by continuous meters, which the distributor installs after the application is submitted, within three months. This system applies to all consumption points without electricity generation and to generators with installed power up to 50 kW. Below is an image showing the percentages marked in red, which cannot be deducted, and the dark blue 27%, which can be shared.

Image 3: Breakdown of Electricity Price Components for a Four-Member Household (No Electric Heating, Czech Republic)



Source: https://www.kurzy.cz/elektrina/

- **Social acceptance, historical context, and local support.**

The development of renewable energy communities (RECs) in the Czech Republic must be understood within the broader historical context of its centralized energy system, shaped during the socialist era (1948–1989) when all energy production and distribution were state-controlled. This legacy of centralization persisted into the post-communist transition, with energy markets dominated by large utilities and limited citizen participation (Hoicka et al., 2021). As a result, Czech society initially lacked experience with decentralized energy governance models such as community ownership. Social acceptance of RECs has been slow but accelerated in recent years, especially following EU initiatives like the Renewable Energy Directive II (Directive (EU) 2018/2001), which emphasized citizen involvement and democratization of energy systems. The national adoption of "Lex OZE II" in 2024 provided the legal foundation for RECs

- **Identified drivers and barriers.**

REC development in the Czech Republic is driven by EU pressure (RED II), falling solar costs, municipal leadership, and increasing availability of public funding, including the Modernisation Fund. Legal recognition through Lex OZE II finally enabled energy sharing, creating optimism for bottom-up energy initiatives. Yet several barriers persist: electricity sharing remains subject to most grid fees, limiting cost benefits; administrative complexity can deter smaller communities; and financial access is limited, as banks remain cautious and subsidies are often competitive or insufficient (Directive (EU) 2018/2001). Technical constraints such as grid saturation and slow rollout of smart meters also pose local challenges. While the groundwork is now in place, the long-term success of RECs in Czechia will depend on regulatory refinements, improved financial support, and capacity-building at the local level.

4. Comparative Analysis

The introduction of Energy Communities (RECs) in Austria and the Czech Republic shows notable variations in legal preparedness and economic frameworks as well as differing levels of social approval while also shedding light on common obstacles faced by both countries.The examination of these aspects aims to draw insights that could guide EU initiatives, for transitioning towards community centered energy solutions.

Austria is leading the way in implementing EU guidelines on energy communities by embracing the Renewable Energy Directive II (RED II) as well as the Electricity Market Directive (EMD) demonstrated through the introduction of the Renewable Expansion Act which offers a strong legal foundation for setting up RECs with a focus on community based management and decentralized decision making processes. In contrast, to Austrias progressiveness is Czech Republics struggle with alignng its legislation promptly. The implementation of Lex OZE II and its fundamental law governing energy communities was initially anticipated for 2021. Was only put into action in 2024 instead.The delay in this process has impeded the countrys capacity to effectively establish RECs and highlights an institutional reaction, to EU directives.

Austria has put in place support systems to encourage the development of renewable energy certificates (RECs) from an economic perspective.They offer subsidies and tax relief as well as financial tools to reduce the initial expenses for renewable energy projects in local areas.Austria also promotes collaborations between the private sectors to utilize private sector knowledge and

resources, for community projects.On the hand the Czech Republic struggles with obstacles related to funding accessibility despite implementing subsidies and financial strategies. The high upfront expenses continue to be a barrier, for towns and community groups because there is no well established program offering specific loans or grants to support them financially. Additionally Czech renewable energy projects still have to pay the grid fees regardless of producing energy locally This restriction hinders the economic feasibility of such initiatives.

In terms of approval there is a noticeable difference between the two countries mentioned in the text above. Austria has a history of cooperative efforts that have traditionally given its people power through collaborative resource management practices This cultural foundation has led to active community participation and confidence in joint energy projects Austrian initiatives like the Bürgerkraftwerk solar project in Vienna and the E Carus transportation initiative, in Carinthia serve as prime examples of how involving the community effectively contributes to transitioning towards sustainable energy practices. In the Czech Republic though the influence of energy management from the socialist era has set the stage for a fresh idea of community ownership of energy resources to emerge. While there is increasing interest in RECs particularly with recent EU incentives in mind there remains a lack of substantial experience, with participatory governance and localized energy management.

Both countries have their unique paths to navigate but they both encounter similar hurdles along the way. Dealing with red tape and navigating through permitting procedures and regulatory hoops present challenges for the development of renewable energy sources in Austria and the Czech Republic. Moreover both nations face pushback from residents in what is known as NIMBYism. Where backing for clean energy initiatives is strong in theory but met with resistance when specific projects are proposed near residential areas. In both instances increasing transparency, boostin awareness among the public and involving stakeholders early in the project planning have shown to be strategies, in overcoming opposition.

Austrias successful adoption of RECs highlights the advantages of legal conformity and strong institutional backing within a collaborative cultural context. The lessons learned from their journey can provide guidance for the Czech Republic as it embarks on a critical stage in REC advancement. Despite facing challenges related to finances, regulations and societal acceptance recent changes in the system demonstrate an increasing dedication, to community driven energy initiatives. By concentrating on making administrative tasks simpler and more efficient while enhancing

incentives and fostering trust within the community could greatly boost the implementation of Renewable Energy Certificates, in both settings.

5. Conclusions

As previously mentioned, the Czech Republic needs to significantly increase the capacity and expand the implementation of energy communities. This necessity is also addressed in the document Recommendations for the Development of Energy Communities, issued by the Ministry of the Environment of the Czech Republic. The material provides concrete recommendations and methodological tools for municipalities and other stakeholders to facilitate the establishment and development of community energy systems in accordance with the European regulatory framework (Ministry of the Environment, 2024).

Community energy - seen as a lever for decarbonisation, energy self-sufficiency and local economic resilience - requires targeted adjustments to the Czech legal and regulatory framework. Based on the current phase of RED II transposition, we formulate four key measures whose implementation could unlock the full potential of energy communities in the Czech Republic.

1. Enable more ways of sharing electricity.

We propose that legislation should allow not only static allocation keys but also dynamic and time-of-use models. Dynamic sharing (based on real-time consumption) and peak and off-peak sharing schemes reflect the actual load on the network, promote behavioural flexibility and stimulate investment in smart control technologies. The plurality approach reduces barriers to entry for communities with different social structures and load profiles.

2. Minimise administrative barriers and transaction costs.

Registration should be completed via a single digital form, with no duplicate fees or parallel approvals from multiple authorities. Legal, accounting and technical overheads are critical for small municipalities or housing co-operatives; streamlining is therefore essential to include socially vulnerable groups and remote regions.

3. Create economic incentives that truly reflect the benefits of local generation.

Tariff design and fiscal instruments must signal to members that local sharing saves grid capacity and reduces technical losses. Accordingly, we advocate lower regulated charges (distribution, system services) for shared electricity and supportive measures—such as tax deductions or zero-interest loans—for battery storage investments. Positive incentives have shortened payback periods in Austria and could do the same in the Czech context.

4. Ensure a high standard of member protection.

We propose the establishment of an independent oversight body (possibly under the Energy Regulator) to oversee the fairness of contracts and protect vulnerable customers. Lasting trust is essential for the stability of the community and therefore consumer protection is an integral part of the legislation.

We believe that the implementation of these four measures could create a predictable and inclusive environment that will accelerate investment in community energy, promote regional development, and protect end users.

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