Common Goods and Modern Commons: Insights on Energy Communities from the Energy4All Project

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1 ABSTRACT

The concept of the commons, emphasizing shared and sustainable resource management, is gaining relevance in addressing global challenges such as climate change and the energy transition. Energy Communities (ECs) exemplify this modern commons approach by enabling citizens to collectively produce, share, and consume renewable energy, promoting sustainability, social equity, and decentralized energy systems.

The EU-funded Energy4All project explores different EC and Positive Energy District (PED) models through pilot cases in Norway, Austria, Hungary, and Italy. These include private-public collaborations, energy poverty initiatives, and community hubs fostering local engagement. The project aims to identify best practices, analyze stakeholder behavior, and establish replicable governance models. It also supports policy advocacy, knowledge exchange, and cross-border collaboration to advance EC models.

This paper presents interim findings from the project's first year, highlighting pilot cases and key lessons. Early results reveal differences in regulatory frameworks and diverse national and local approaches. Looking ahead, Energy4All seeks to refine its roadmap for replicating successful EC models across Europe, integrating stakeholder engagement, policy analysis, and practical insights to support sustainable and socially just energy solutions.

Keywords: planning, participation, energy communities, PED, energy transition

2 THE OBJECTIVES AND METHODOLOGY

One of the aims of the Energy4All project is to compare the legal frameworks for ECs and PEDs in Norway, Austria, Hungary and Italy. By analyzing these frameworks, we seek to identify the factors that facilitate or hinder the development of such initiatives, as well as to determine the key stakeholders involved and effective strategies for their engagement. In order to do so, this paper will rely on the idea of the energy as a commons (Ostrom 2015; Ostrom 2011; Hess 2008), which advocates for a more collective and democratic management of energy resources, where communities play an active role in production, distribution, and governance (Soto-Acosta et al., 2018). This concept further alignes with the Quintuple helix model of governance (Carayannis and Campbell 2010; Carayannis, Barth, and Campbell 2012), which integrates five key societal subsystems – academia, industry, government, civil society, and the environment – to drive sustainable innovation. This model provides a structured way to understand how different actors can collaborate to decentralize energy production, democratize access, and promote sustainability through community-driven energy initiatives. One of the main aspects under investigation is the extent to which national regulations and policies support or constrain the establishment of energy communities. Legal provisions, financial incentives, and administrative procedures vary significantly between countries, influencing the feasibility and attractiveness of energy-sharing models. By understanding these differences, we can highlight best practices and potential barriers that need to be addressed.

Another critical focus is the identification of relevant stakeholders and their roles in the implementation and operation of energy communities. These stakeholders include government agencies, municipalities, energy providers, technology companies, and civil society organizations. Understanding their interests, incentives, and potential conflicts is essential for designing inclusive and effective governance models.

This paper's methodology examines case studies through regulatory frameworks, institutional context, key stakeholders, and the quintuple helix model. Analyzing these elements will yield preliminary insights after the project's first year, identifying effective strategies and governance models for broader application. These findings will support the development of replicable models for long-term impact. The study employs

qualitative and comparative methods, combined with institutional analysis of the commons (Ostrom 1986), aligned with ENERGY4ALL's objectives.

3 PILOT CASES

The project has six different pilot cases in four European countries: Norway, Austria, Hungary and Italy. A description of pilots follows.

3.1 Hillevåg, Stavanger (Norway)

The PED Hillevåg explores public-private partnerships to repurpose waste heat from industrial animal feed production, creating opportunities for local energy supply optimization. So far, public-private partnerships and industrial processes have received limited attention in PED initiatives. PED Hillevåg examines how synergies between industry, municipal authorities, and other stakeholders can be fostered to enhance local energy flexibility. Industrial processes are major urban carbon emitters, posing a key challenge for decarbonization. Reusing waste energy, transitioning to cleaner sources, and cross-sector coordination are essential for PED development. These efforts require public-private partnership models to enable cooperation across different sectors and achieve ambitious urban climate targets. Key stakeholders involved in the project include two local heavy industrial partners, Felleskjøpet and Skretting, as well as Stavanger Municipality, the University of Stavanger and citizen interest groups near PED Hillevåg.[1] The expected impact of this pilot extends beyond local benefits, aiming to contribute nationally and even at the EU level. By developing an innovative public-private partnership model for PED development, the project seeks to advance understanding of the challenges and opportunities associated with cross-sector collaboration.

3.2 Lebring- St. Margarethen and Graz-Umgebung-Süd (Austria)

In Austria, there are two pilot projects: Lebring-St. Margarethen and the region Graz-Umgebung-Süd (GU-Süd). Both are located in Styria. The regional Renewable Energy Community Lebring-St. Margarethen has a legal form of an association ("Erneuerbare Energiegemeinschaft (EEG) Lebring-St. Margarethen"). This association aims to promote energy from renewable sources while considering environmental, economic, and social benefits for the region and its partners – particularly through the regional production, storage, use, and sale of renewable energy. Additionally, purchasing renewable energy from members of the association is a key component (EEG 2023, 2–3). The energy community was established as a private initiative, with private individuals as members. In September 2024, the municipalities of Lebring-St. Margarethen, Lang, and Hengsberg joined the energy community.[2]

The six municipalities of Fernitz-Mellach, Gössendorf, Hart bei Graz, Hausmannstätten, Raaba-Grambach, and Vasoldsberg have been cooperating since 2001 within the inter-municipal, non-profit development association "Graz-Umgebung-Süd" (GU-Süd, n.d.). The six municipalities of GU-Süd are organized as the cooperative "Erneuerbare Energiegemeinschaft GU Süd eGen". The goal is to establish two regional renewable energy communities to enhance regional energy autonomy, especially in times of crisis. Additionally, the initiative aims to reduce energy costs – not only for the municipalities themselves but also for SMEs and private households. In this case, the initiative is led by the municipalities, which differs from the approach in Lebring, where the initiative came from the citizens. A comparison after a longer support phase will help identify the key success factors for each approach.

3.3 Kazán and Ascend (Hungary)

The primary goal of the project Kazán is to collaboratively develop an energy plan, enhance the energy efficiency of the building, and maximize PED performance by leveraging the 36 kW solar panels already installed on the rooftop. Additionally, Kazán aims to establish a human-centered approach to business and co-governance models for PEDs that are both scalable and replicable. The Kazán Community Center hosts various organizations. The center already operates under a well-established collaborative management system, which has been instrumental in shaping the energy community's governance structures. Solidarity

[1] Energy4All project, DUT call 2022, Deliverable 3.2 – Energy community engagement, delivery date: January 2025, classified as confidential.
[2] Energy4All project, DUT call 2022, Deliverable 4.2 – Energy community engagement, delivery date: December 2024, classified as public.

and co-ownership are the core principles of the building's management, and these values extend to the energy community initiative as well. The key stakeholder are the various organizations and the Alliance for Collaborative Real Estate Development (ACRED) as the key partner managing daily operations. As one of Hungary's first energy community initiatives, the project aims to establish a sustainable collective management model that can serve as a blueprint for similar energy communities.[3]

The pilot case Ascend focuses on the transformation of a disused school building into social housing units. The primary goal is the energetic refurbishment of the former school to create sustainable and affordable housing while integrating it into a locally developed Clean Energy District as part of the ASCEND project. This initiative aims to accelerate the deployment of PEDs and foster energy-efficient urban development. A key project focus is refurbishing the school building with photovoltaic panels to boost renewable energy. Plans also include EV charging points, traffic-calmed "school streets", and citizen-focused initiatives with the Climate Agency, fostering a more sustainable urban environment.[4]

3.4 Quarticciolo (Italy)

This pilot project aims to combat energy poverty by developing an energy community in the Quarticciolo social housing estate. This neighborhood is located in the peripheral urban area of eastern Rome and it has long been associated with social struggles, economic difficulties, and limited access to resources. However, in recent years, Quarticciolo has emerged as a laboratory of grassroots initiatives aimed at fostering local empowerment, urban regeneration, and sustainability. Quarticciolo's transformation is driven by a strong network of social enterprises and community-led initiatives, including cooperative businesses, cultural spaces, and projects promoting circular economy practices. Through collective action, it seeks to provide affordable and sustainable energy solutions while empowering residents socially and environmentally. The pilot highlights the power of self-organised communities, where collective action fosters resilience, local knowledge drives innovative solutions, and bottom-up approaches ensure ownership and adaptability. Key stakeholders include local inhabitants, city and regional administrations, socially responsible enterprises, financial backers, and other self-organised citizen entities like cooperatives. The expected impact ranges from creating a replicable local model for energy communities to establishing a national network and contributing to similar European projects.[5]

4 DISCUSSION ON REGULATORY FRAMEWORKS

The case studies differ in structure, stakeholder engagement, and financial and governance models, largely due to variations in national legal frameworks for ECs and PEDs. While all fall under the EU's Clean Energy for All Europeans Package (CEP)[6], national regulations vary significantly. This analysis focuses on ECs rather than PEDs, as they overlap but have distinct scopes – PEDs are an urban planning concept without a unified EU legal framework, relying instead on national and local regulations. Additionally, ECs in this context refer to Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs), the terms adopted in some national legislations.

In Norway, the regulation of energy communities is governed by national legislation, primarily through the Energy Act (Energiloven)[7], Energy Regulations (Energilovforskriften)[8], Grid Regulation and the Energy

[3] Energy4All project, DUT call 2022, Deliverable 5.2 – Energy community engagement, delivery date: February 2025, classified as public.

[4] These data were extracted from different internal documents and individual reports of the Energy4All project, as well as the project proposal.

[5] Energy4All project, DUT call 2022, Deliverable 6.2 – Energy community engagement, delivery date: January 2025, classified as public.

[6] Of which the most important documents are: The Renewable Energy Directive 2018/2011 (RED II), (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 (recast)), Official journal of the European Union, L328/82 and Directive on common rules for the internal market for electricity 2019/944 (IEM), (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 (recast)), Official journal of the European Union, L158/125.

[7] Energy Act (Energiloven), (1990:50) – Lov om produksjon, omforming, overføring, omsetning, fordeling og bruk av energi m.m., LOV-1990-06-29-50, Norway.

[8] Energy Regulations (Energilovforskriften), (1990) – Forskrift om produksjon, omforming, overføring, omsetning, fordeling og bruk av energi m.m., FOR-1990-12-07-959, Norway.

Market Regulation (Nettregulering og Energimarkedet-forskriften – NEM)[9]. As Norway is not a member of the European Union, its legislation does not apply directly (McElhinney et al., 2022) and as such, energy communities conforming to the definitions of CECs and RECs in accordance with the EU law have not yet been implemented. Consequently, Norway has developed its own legal frameworks. A distinctive feature of Norway's approach is the emphasis on licensing and governmental oversight. This means that various energy-related activities obtain licenses, ensuring that all interests are considered and that projects are evaluated on a case-by-case basis. Several legislative and practical barriers hinder the implementation of energy communities in Norway. Besides the Energy Act and related regulations restrict energy production, sharing, and storage among residential buildings, historically low energy prices and a well-functioning energy system have limited public awareness of alternative energy solutions. Overall, it can be said that the development of energy communities regulatory framework in Norway is still in its early stages (weak development).

In Austria, energy communities are regulated under the Renewable Energy Expansion Act (Erneuerbaren-Ausbau-Gesetz, EAG)[10] and Complete Legislation for Electricity Markets and Organization Law (Gesamte Rechtsvorschrift für Elektrizitätswirtschafts- und -Organisationsgesetz, short ElWOG)[11]. The EAG provides a legal framework for RECs, enabling citizens, small and medium-sized enterprises (SMEs), and local authorities to collaboratively produce, consume, store, and sell renewable energy within a localized area. A Renewable Energy Community is permitted to generate energy from renewable sources for self-consumption, storage, or sale. A REC must be legally structured as an association, cooperative, partnership, corporation, or a similar legal entity. Its primary objective cannot be financial profit. The main priority of a REC is to deliver environmental, economic, or social benefits to its members and the local community where it operates. The legal requirement that an energy community's primary purpose cannot be financial profit has led to confusion among stakeholders about its permissible activities and limitations. Overall, it can be said that the development of energy communities regulatory framework in Austria is very developed (strong development).

The Hungarian 2021 amendment to Electricity Act LXXXVI[12] established a framework for energy communities, recognizing Renewable Energy Communities (RECs) as a specific category. RECs are granted rights and responsibilities solely within the electricity sector, allowing them to engage in activities such as production, storage, consumption, distribution, aggregation, electromobility services, and electric charging operations. However, the law excludes heating and cooling, diverging from EU regulations that permit RECs to operate across all renewable energy sources, not just electricity. RECs in Hungary can generate, consume, store, and sell electricity from renewable sources. While a registry for RECs has been created, additional implementing regulations are still required to fully define the operational framework for energy communities. Energy communities must be organized as legal entities, such as associations, cooperatives, partnerships, or corporations. Their primary objective cannot be financial profit but environmental, economic, or social community benefits to their members or the local areas in which they operate. While the existing legislation provides a foundation for energy communities, there is a recognized need for further implementing acts to clarify operational details. Overall, the development of energy communities regulatory framework in Hungary is complex and unstable (medium development).

In Italy, the regulation of energy communities has evolved significantly since 2019, aligning with the European Union's directives. The prompt response of Italy to the RED II Directive has led to a flourishing of RECs. The key legislative milestones are The “Milleproroghe” Decree[13], ARERA Resolution[14] and MiSE

[9] Energy Market Regulation (Nettregulering og Energimarkedet-forskriften – NEM) – Forskrift om nettregulering og energimarkedet., FOR-2019-10-24-1413, Norway.
[10] Federal Act on the Expansion of Energy from Renewable Sources (Renewable Energy Expansion Act) – Bundesgesetz über den Ausbau von Energie aus erneuerbaren Quellen. (Federal Law Gazette, FLG) I no 150/2021 (National Council: GP XXVII RV 733 AB 982 p. 115. Federal Council: 10690 AB 10724 p. 929.) [CELEX no: 32018L2001, 32019L0944, 32019L0692]. Austria.
[11] Complete Legislation for Electricity Markets and Organization Law – Gesamte Rechtsvorschrift für Elektrizitätswirtschafts- und -Organisationsgesetz, No. 110/2010. CELEX-Nr.: 32019L0944. Austria.
[12] Act No. LXXXVI of 2007 on electricity and Governmetnal Decree No. 273 of 2007 (X.19.) – 2007. évi LXXXVI. törvény a villamos energiáró. Hungary.
[13] Decree Law No 198/2022 – Millepropoghe, 29 December 2022, Official Gazette no. 18, Italy.
[14] ARERA Resolution no. 318/2020 August 2020. Italy.

(Ministry of Economic Development) Implementing Decree[15]. The Milleproroghe Decree defines the characteristics of jointly acting self-consumers and RECs. According to it, individuals, businesses, local authorities, and communities are permitted to take part in RECs; however, their participation cannot be their primary professional activity (Di Silvestre et al., 2021). Italian law supports these initiatives by providing incentives and regulatory frameworks, encouraging the development of decentralized energy systems that empower communities to actively participate in the transition to clean energy. Governed through cooperative and association-based models, RECs prioritize open and voluntary participation, reinforcing a sense of shared responsibility among members. RECs also face several challenges and limitations that can hinder their development and effectiveness as financial and technical barriers. Although incentives exist, the initial investment costs for infrastructure can be high. Another limitation is the geographical constraint: since energy sharing is restricted to members connected to the same low-voltage distribution substation, expansion opportunities are limited. Market competition and grid dependency pose risks for RECs, as they operate in a market dominated by large utility companies with greater influence and rely on national grid infrastructure, making them vulnerable to fees and regulatory changes. Nonetheless, Italy's regulatory framework for energy communities is highly developed (strong development).

5 PRELIMINARY FINDINGS

This analysis explores the relationship between regulatory and societal elements to better understand different national approaches. Insights from objectives, case studies, and regulatory frameworks informed the design of the analytical grid (Table 1) and the establishment of key Analytical Framework Areas: ECs' main goals, institutional structure, stakeholder involvement (five helices), and regulatory development.

This analysis identifies three key factors influencing the success of the study cases: the institutional structure of ECs, the diversity of stakeholder involvement, and the level of national regulatory development. Ideally, a balanced bottom-up and top-down approach (Sareen et al., 2022), supported by a fully developed quintuple helix model within a strong regulatory framework, would create optimal conditions for EC success. However, this is not always the case, as not all study cases exhibit these elements simultaneously. The analytical grid suggests a correlation between strong regulatory frameworks and high public administration involvement, as seen in the Austrian pilots and, to some extent, in Italy. However, in Italy, inconsistent administrative approaches and weak horizontal coordination create challenges. Conversely, in cases where top-down intervention is weaker, a strong community engagement strategy involving diverse stakeholders can help compensate for this gap, as demonstrated by the Kazán case in Hungary.

	Stavanger, Norway	**Lebring- St. Margarethen, Austria**	**GU Süd, Austria**	**Kazán, Hungary**	**Ascend, Hungary**	**Quarticciolo, Italy**
Main goal behind EC	Optimize local energy supply	Promote energy from renewable sources	Enhance regional energy autonomy	Adopt human-centered business and co-governance models for PEDs.	Create sustainable and affordable housing	Provide solutions for energy poverty in social housing estates
Institutional structure of EC, type of initiative	Public-private partnership between industry and municipality	Private initiative; following expansion to municipalities	Municipal association, with future expansion to citizens and SMEs.	Collectivly owned building with various organizations	Top-down initiative with a strong presence of public administration	Private bottom-up initiatives
Key stakeholders and presence of five helices	Two industrial partners, Municipality and University Stavanger	Private households, municipalities, So-Strom	Six municipalities, So-Strom	Organizations in community center, ACRED	Municipality of Budapest	Local inhabitants, small businesses, local civic organizations
Regulatory Framework	Weak	Strong	Strong	Medium	Medium	Strong

Table 1: Analytical grid.

5.1 Limitations and and challenges

This project undertakes a comparative analysis of the legal frameworks and approaches to energy communities across four European countries. It seeks to identify successful solutions for promoting the development of ECs, while also pinpointing key obstacles and barriers hindering their implementation. It is important to note that the project's scope does not extend to a detailed analysis of the dynamic developments

[15] "Ministry of Economic Development Implementing Decree." MiSE, September 2020. Italy.

and price variations within the broader energy market. Furthermore, the project acknowledges the significant variations in socio-economic conditions across the studied countries, recognizing their influence on the motivations and incentives driving the establishment and success of energy communities.

6 PROJECT OUTLOOK

A key aspect of this research is to understand the regulatory and institutional conditions, as well as stakeholder engagement strategies, that facilitate or hinder the establishment of successful ECs. The preliminary observations of the project strongly suggest that creating the necessary conditions for thriving ECs and PEDs requires a multi-faceted approach: a robust stakeholder engagement strategy, proactive policy and law-making, and the adaptation of project experiences and results – such as those from Energy4All – to specific national contexts and necessities. Given the significant variations in national legal frameworks, as highlighted in the case studies across Norway, Austria, Hungary, and Italy, strengthening cross-border collaboration and knowledge-sharing becomes crucial to bridge existing gaps. However, effective cross-border learning necessitates a common definitional ground. Achieving a shared understanding of what constitutes an EC and a PED is paramount to ensure the comparability of energy communities across Europe. This, in turn, requires further harmonization of national regulations within the overarching framework of EU directives, such as the Clean Energy for All Europeans Package. Such harmonization would not only clarify the landscape of facilitators and barriers to EC and PED development but also promote greater investment certainty and scalability.

In this context, projects like Energy4All serve as valuable catalysts and should be replicated and scaled up strategically. One of the key outcomes of Energy4All will be its transfer and implementation plan, which offers a structured approach to adapting successful EC models to diverse contexts across Europe. By systematically applying these plans and continuing to learn from pilot projects, we can unlock the full potential of energy communities to drive a sustainable, equitable, and decentralized energy transition.

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