STATE-OF-THE-ART REPORT ON ENERGY COMMUNITIES

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CO-PED Cultural centres as catalysts for energy communities
DUT Driving Urban Transitions
EUROPEAN PARTNERSHIP
Co-funded by the European Union

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Project Summary

The Co-PED (Community-based cultural and social centres as incubators for Positive Energy Districts) project explores how social and cultural centres (SCCs) can serve as catalysts for the energy transition by becoming hubs of local energy communities. In response to the energy crisis and increasing energy poverty, Co-PED develops and tests innovative financial, governance, and technological models for decentralised energy systems rooted in civic engagement and cultural infrastructure. Through eight Urban Living Labs across urban, peri-urban and rural contexts in Europe, the project combines applied research with community participation to foster energy justice, urban-rural cooperation, and local value creation. By empowering SCCs and promoting democratic decision-making and inclusion, Co-PED aims to produce policy recommendations and transferable models that support Positive Energy Districts and cultural resilience across diverse territories.

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Deliverable executive summary

This deliverable provides a state of the art of energy communities and social and cultural places. The aim is to offer a definition of both energy communities and social cultural places. As argued in the proposal, community-based social and cultural places can be a breeding ground for energy communities. They're places where people meet, share knowledge and experiences and build first bonds that form the foundation of future energy communities. This report investigates the role social and cultural places play in building energy communities. It also explores the various types of energy communities already seen in Europe, from urban to rural communities. Lastly, this report provides insight into some already existing examples of merging social and cultural places with the energy transition. Within these examples of energy communities the report gives insight into how energy communities already work.

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1. Introduction

1.1 Brief overview of the CO-PED project

Co-PED (Community-based cultural and social centres as incubators for Positive Energy Districts) is a research-oriented European project that explores how cultural and social centers (SCCs) can become key drivers of the energy transition. In a context marked by rising energy costs and growing energy poverty, Co-PED seeks to transform these centers, which are already deeply embedded in their local communities, into active nodes of decentralized, cooperative energy communities. The project addresses both technical and societal challenges by developing innovative legal, financial, and organizational models for Energy Communities (ECs) and Positive Energy Districts (PEDs), rooted in principles of energy justice, democratic governance, and community engagement.

Through eight Urban Living Labs across diverse urban, peri-urban, and rural contexts in six European countries, Co-PED tests how SCCs can leverage their existing social infrastructure to accelerate renewable energy generation, distribution, and collective ownership. The project places particular emphasis on building urban-rural cooperation through models such as virtual energy communities, while supporting inclusive participation, especially among marginalized groups. By integrating policy research, applied experimentation, and stakeholder engagement, Co-PED aims to deliver practical toolkits and policy recommendations, offering scalable and replicable solutions that empower communities and inform Europe's just and inclusive green transition.

1.2 Definition of cultural and social communities

Before entering into the particularities of the cultural and social communities and, in the end, energy communities, it is important to understand what a community itself is and which elements constitute it. Early community studies often viewed communities as small, tightly knit groups (as villages or neighborhoods), but modern perspectives recognize that communities can also be large, dispersed, or even purely virtual. Generally speaking, a community can be defined with respect to the geographical area, demographic context as age, ethnicity, educational, environmental or political status. According to Bartle[1]A community is a sociological construct which does not have to have a physical location, but it has to be demarcated by being a group of people with common interests. In that sense, it is a set of interactions, human behaviors and expectations between members.

[1] Bartle, Phil. *What is community*. A sociological perspective. 2007.

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Having said that, what “glues” the community and differs it from the simple haphazard assemblage[2] is the relationship between its members, a foundation of unity, closeness, physical proximity and intellectual proximity[3]. All of these notions can be broken into key components that characterize a community:

1. Shared Identity or Common Bonds: Communities typically have a collective identity or shared characteristics. Members may share values, cultural norms, beliefs, interests, or an identity that ties them together. The shared identity gives members a sense of *“we-ness”* or belonging. Psychologists McMillan and Chavis, for instance, identified *membership* (the feeling of belonging) and a shared emotional connection as essential elements in the *“sense of community”* that binds members together[4].
2. Social Ties and Interaction: A community is fundamentally social and, as already mentioned, it consists of relationships. Members are connected by interpersonal ties, networks of support, and patterns of interaction. These social ties can be close-knit (as in small communities where everyone knows each other) or more diffuse (as in large communities or online forums), but there is an expectation of mutual recognition and communication among members. Communities can also be perceived from the perspective of strong and weak ties[5]. Strong ties are usually seen as the close-knit ties between community members, such as relatives, friends or close neighbors. Whereas, weak ties are ties between members of different communities. The emphasis with communities tends to lie on the strong ties, but Granovetter argues that it’s the weak ties that actually form a bridge between social networks. It’s important for the simple reason that weak ties provide people with access to different networks, knowledge and opportunities.
3. Shared Space: Many communities are rooted in a geographic place, for example, people living in the same village, town, or neighborhood constitute a community of place. A physical location can be of importance, especially if it functions as a *bumping place*[6]. As mentioned in However, a shared physical location is not a requirement for community; communities can also exist in virtual spaces or across distances.

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[2] A. J. Underwood, ed. D. M. Raup and D. Jablonski. *What Is a Community?*. Patterns and Processes in the History of Life. Springer. 1986.

[3] Ferdinand Tonnies and C. P. Loomis. *Community and Society*. Routledge. 2017.

[4] McMillan, David W., and David M. Chavis. *Sense of community: A definition and theory. Journal of community psychology* 14, no. 1 (1986): 6-23. 1986.

[5] Granovetter, M.S., 1973. *The Strength of Weak Ties*. American Journal of Sociology, 78, no. 6 (1973): 1360-1380. 1973.

[6] A "bumping place" refers to a community gathering spot where people naturally encounter each other, such as a neighborhood cafe, library, or park, fostering casual conversation and stronger social bonds. The term can also refer to digital spaces, like online forums, where users "bump" a thread to the top of a list.

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4. Common Interests or Goals: Communities often form around some common purpose, interest, or goal that people jointly pursue. Members may engage in *"joint action"* or collective activities together. A community of interest is explicitly defined as a group of people who "share a common interest or passion," exchanging ideas and knowledge on that topic while perhaps caring little about other aspects of each other's lives.
5. Sense of Belonging and Mutual Support: An intangible but crucial component of community is the psychological feeling of belonging and solidarity among members. Communities cultivate a sense of trust, mutual obligation, and support. Members often feel loyalty or attachment to their community and to one another. They adhere to shared norms and look out for each other, which contributes to a *"collective conscience*[7]*"* that guides behavior.

Having said that, cultural and social communities (SCCs) are communities in which some of the above-mentioned aspects are emphasized. They are defined as grassroots groups of people united by shared cultural heritage, values, or social ties in a given place and time.

Entering more into details, it can be said that a social community emphasizes the relational dimension of community: it is primarily defined by the network of social ties, interactions, and shared practices among people. It builds on the core elements of community: belonging, social ties, and shared interests. What distinguishes it is that relationships and mutual recognition are at the center. Members connect not only because they share a space or activity, but because they create and maintain a web of social relations that gives them identity and support. Their strength lies in the quality of interactions and social capital they generate: trust, reciprocity, and solidarity that make collective life possible[8].

A cultural community emphasizes the shared cultural framework that binds people together: traditions, language, symbols, heritage, norms, values, and collective memory. Here the common bond is cultural identity, rather than just social interaction. Such communities unite and gather around cultural aspects such as local traditions, collective history, or social activities. This fosters a strong sense of belonging and identity among members. An excellent example of SCC is the heritage community, which the Council of Europe's Faro Convention defines as "*people who value specific aspects of cultural heritage which they wish, within the framework of public action, to sustain and transmit to*

[7] Durkheim, Émile. *Introduction à la sociologie de la famille*. BoD-Books on Demand, 2023.

[8] Ronald Labonte, "Social Capital and Community Development: *Practitioner Emptor*," *Australian and New Zealand Journal of Public Health* 23, no. 4 (1999): 430–33. 1999.

future generations"[9]. Research shows that cultural heritage can be a "powerful tool" that helps people build a sense of belonging and act collectively when facing challenge[10].

Often emerging from bottom-up initiatives, these groups operate autonomously with democratic, participatory structures, rather than being imposed top-down[11]. This bottom-up, community-driven character means members share trust, mutual responsibility, and a common purpose. In the context of energy transition, such cultural/social communities can provide an ideal social foundation for new energy projects. Their strong internal cohesion and local knowledge make them effective at mobilizing collective action. For instance, rallying neighbors to adopt renewable energy or manage resources jointly, and improving public acceptance of local energy initiatives. In other words, a culturally unified community with deep local roots can naturally evolve into an energy community by channeling its social capital and sense of solidarity towards shared energy goals.

Besides the strong cohesion aspect, cultural and social communities can also represent a legal and financial potential for forming energy communities. Modern policy frameworks increasingly enable these cultural and social communities to formalize as energy-producing cooperatives or energy communities. Under recent EU directives (the Clean Energy Package), Renewable Energy Communities (RECs), defined by REDII[12] and Citizen Energy Communities (CECs), defined by IEM[13] are legally recognized as organizations based on voluntary, open membership with a primary purpose of providing environmental, economic, or social community benefits rather than private profit. This means that a heritage or cultural association, for example, can legally establish itself as an energy-sharing cooperative while staying true to its community-oriented mission. Crucially, EU law also requires Member States to create "enabling frameworks" for these communities, including tools to facilitate access to finance and information, to help local groups launch renewable energy projects[14]. This legal support de-risks investments by community members and often provides access to grants or favorable funding for feasibility studies, installations, and other start-up costs. In practice, a cultural community

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[9] Article 2(b) (Definitions), Council of Europe, "Council of Europe Framework Convention on the Value of Cultural Heritage for Society" (Council of Europe Treaty Series – No. 199), Faro, 27/10/2005.

[10] Seduikyte, Lina, Indre Grazuleviciute-Vileniske, Aušra Mlinkauskienė, and Eglė Januškienė. *Fostering Resilient Communities Through the Interaction of Heritage, Policy, and Participation: Insights from a Lithuanian Case Study*. Sustainability 17, no. 9: 3883. 2025.

[11] Kim, Soheon, and Sanila Pradhan. *Understanding the Politics of Institutionalization in Alternative Cultural Centers*. Erasmus 4, no. 2017. 2019.

[12] 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.

[13] 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.

[14] Arnould, J., and D. Quiroz. *Energy Communities in the EU Opportunities and Barriers to Financing.* For Friends of the Earth Europe; Profundo Research and Advice*. 2022*.

can tap into collective financing schemes to fund solar panels, wind turbines, or energy efficiency upgrades, pooling resources from members and external supporters. The regulatory framework is flexible regarding organizational form: energy communities may adopt various legal entities (cooperative, social enterprise, nonprofit association, etc.), each with its own governance and financing model. Such flexibility allows cultural and social communities to choose a structure that fits their ethos and operational needs when venturing into energy. In sum, today's legal and financial conditions empower cultural and social communities to become energy communities as they can leverage supportive laws, funding programs, and their own social cohesion to invest in local renewable energy. This not only provides financial benefits like shared energy savings or reinvested revenue for community projects, but also strengthens community resilience and autonomy by keeping energy resources and profits in local hands.

1.2.1 Social and Cultural Centres

Social and cultural centres are community-based hubs that offer a variety of activities, from artistic and educational events to sports and leisure, to foster social interaction and improve the well-being of individuals and the community as a whole. They serve as gathering places that promote cultural exchange, community development, and civic engagement by providing diverse programs and facilities for people of all ages and backgrounds.

Social and cultural centres are challenging to define due to their multifunctionality, diverse organisation aims and missions, and hybrid positions within various socio-political contexts.[15] Social and cultural centres are distinct in their character yet broad in their scope. However, we can understand social and cultural centres as generally having four definitional attributes: provider and creator, experience and active participation, diversity and multidisciplinary offerings, and interaction and community orientation.[16]

Social and cultural centres can not only be sites for cultural consumption, but also arenas for social interaction, identity formation, and democratic experimentation.[17] Social and culture centres, especially the ULLs within this project, are uniquely positioned to leverage active established internal practices of communal thinking and engagement to realise the most beneficial elements of energy communities. Social and cultural centres are

[15] Pfeifere. *The issues of defining and classifying cultural centres*. Economics and Culture, 19(2). 2022.

[16] Schulte-Basta, D. *Definition and distinction of the concept cultural center using the example of Finland*. *European Journal of Cultural Management and Policy, 15*, Article 14704. 2025.

[17] Eriksson, B., Møhring Reestorff, C., & Stage, C. *Forms and potential effects of citizen participation in European cultural centres*. *Participations: Journal of Audience & Reception Studies, 15*(2), 205–228. 2018.

generally situated amongst the social and cultural communities that they serve, often run by members of the communities.

Due to this cultural embeddedness, social and cultural centres are able to scale the needs and objectives of their members and communities. Centres can scale by formalising and articulating specific social or political issues and goals emerging from their communities. This influence can be both vertical and horizontal, where participation can engender a sense of belonging, democratise decision making processes, and create collective experiences.[18] However, this is incumbent upon organisations with strong institutional frameworks or infrastructures that formally integrate reflexivity into governance and decision-making processes.Tending to fall within three parameters — multifunctionality, a socio-cultural orientation toward the local community, and ownership/possession of a building or technical infrastructure[19] — social and cultural centres are unique community institutions.

1.3 Definition of energy communities

In recent years, the concept of energy communities has emerged as a vital component of the European Union's energy transition strategy. Positioned at the intersection of technological innovation, social mobilization, and policy reform, energy communities are gaining traction as collective energy initiatives that allow citizens and local actors to actively participate in the production, consumption, storage, and distribution of renewable energy. This section synthesizes current scholarly and policy discourse on energy communities, drawing on a systematic literature review and a transition perspective to analyze how they are defined, operationalized, and institutionalized across contexts.

1.3.1 Defining energy communities

Without doubt energy communities are inherently multifaceted constructions, shaped by sociotechnical, legal, economic, and cultural parameters. They are seen as a potential means to achieve a more just and inclusive energy transition, according to the Green Deal[20], by empowering citizens to have a voice and share in the local energy system. The advantages of energy communities range from giving energy end-consumers an active

[18] Ibid

[19] Pfeifere, D. (2022).

[20] European Commission , "Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – The European Green Deal" (COM(2019) 640 final), Brussels, 11/12/2019.

role in the energy market to increasing renewable energy sources and improving overall efficiency[21].

In the terms of defining an energy community, it is certain that an overarching definition for energy communities has been challenging to establish. As highlighted by Bauwens et al.[22]There is no single unified definition of energy communities due to the diversity of actors, governance models, and geographic settings in which they operate. However, central to most definitions is the notion that energy communities prioritize environmental, social, and economic benefits for their members and the broader community, rather than seeking profit maximization. However, the European Commission, particularly through the RED II and IEM have provided a foundational definition for Energy Communities. It results from this overview on these documents that there are two types of energy communities. Further analysis will show that they are very similar but not completely compatible. RED II, in Article 2 titled "Definitions" under point 16 defines renewable energy communities (hereinafter REC) as "a legal entity:

a. which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
b. the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;
c. the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits."

According to this definition, the participants to REC are natural persons, local authorities, and micro-, small and medium sized enterprises are eligible to participate. The same members also control REC, with the condition to be "in proximity" to the project owned by the community. REC has to remain autonomous from individual members or shareholders, meaning that the decision-making power must not be disproportionate between members, following principles of democratic governance.

On the other hand, Article 2 (11) of the IEM defines citizen energy communities (hereinafter CEC) as "a legal entity that:

[21] Lode, M. L., G. Te Boveldt, T. Coosemans, and L. Ramirez Camargo. *A transition perspective on Energy Communities: A systematic literature review and research agenda*. Renewable and Sustainable Energy Reviews 163 (2022): 112479. 2022.

[22] Bauwens, Thomas, Daan Schraven, Emily Drewing, Jörg Radtke, Lars Holstenkamp, Boris Gotchev, and Özgür Yildiz. *Conceptualizing community in energy systems: A systematic review of 183 definitions*. Renewable and Sustainable Energy Reviews 156 (2022): 111999. 2022.

a. is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;
b. has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and
c. may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders."

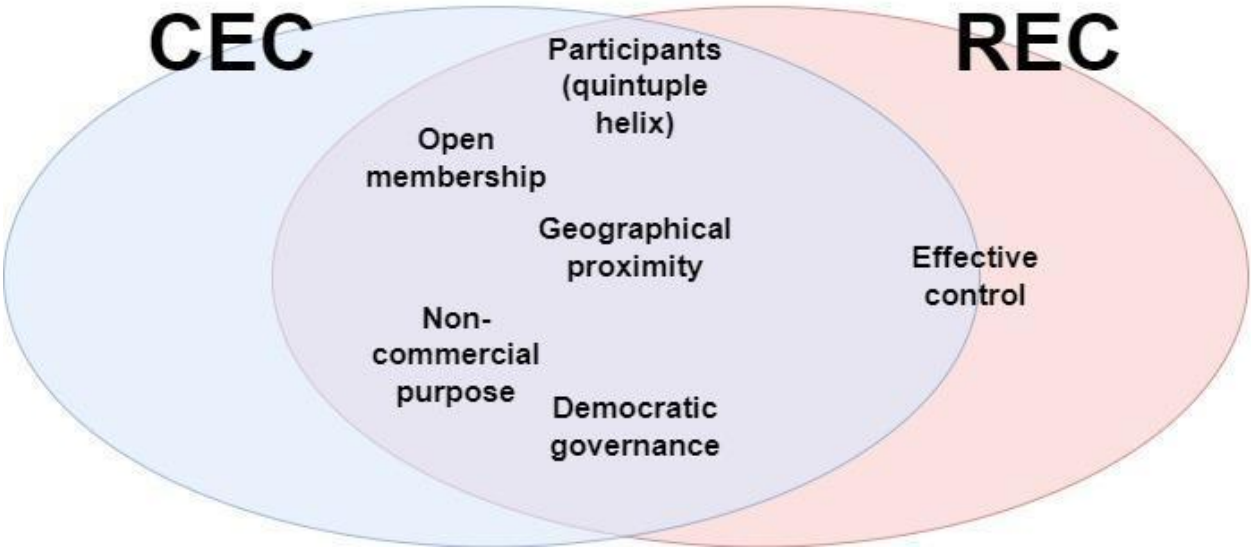

Figure 1: Elements of CEC and REC. Stefanija Hrle Aiello.

Regarding the participation to CEC, IEM goes further stating in the point 44 of Preamble that "membership of citizen energy communities should be open to all categories of entities". This means that, beyond the participants of REC, large enterprises are also eligible to participate. But, as far as it regards control, large enterprises are excluded together with medium sized companies: effective control is limited to members that are natural persons, micro- and small enterprises, and local authorities. In addition, REC also requires the proximity of members, which means that in order to control members cannot be outside of this geographical proximity.

Besides these differences in participants and control, there are other differences that can be deducted from these directives. RED II contains, in its point 71 of Preamble, the

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principle of autonomy. It states that “To avoid abuse and to ensure broad participation, renewable energy communities should be capable of remaining autonomous from individual members and other traditional market actors that participate in the community as members or shareholders, or who cooperate through other means such as investment”. This principle guarantees the democratic governance and adequate representation of all the members. IEM does not contain such a principle. Last but not least, the difference is, although it seems obvious, in the activities. While CEC are engaged across the electricity sector, REC focus only on renewable energy.

Differences aside, these two types of energy communities are also similar to each other. On the first place, the purpose both is to provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits. Next, the participation in both must be open and voluntary. Lastly, the control is in the hands of citizens, local authorities and smaller businesses that are not already active in the energy sector. As a conclusion, it can be said that REC can be seen as a type of a CEC. For the purpose of this study the general idea of an energy community will be adopted. In the cases in which the differences between them play an important role, the configuration of REC will be taken into account, in relation to the Green Deal and the renewable nature of the energy it deals with.

The general interest of the energy community is to produce energy. In this configuration of, citizens become prosumers[23],and collaborate with public administration and private subjects for the purpose of common interest. They reflect collaboration and solidarity as an element of collectivity, the “interaction with the neighbor”

The RED II and IEM do not prescribe a legal form for the energy communities. They just set criteria that describe the model that should be adopted. Energy communities must be legal entities, separate from their members. Next, their main purpose must be non-profit. Naturally, this does not mean that energy communities cannot carry out commercial activities, but they must always have an accessory, instrumental or functional character to achieve their primary purpose. Lastly, participation must be open and voluntary for all subjects[24].

[23] A ”prosumer” is an individual who both consumes and produces. The derives of the words “producer” and ”consumer”. The terms “prosumer” and “presumption” were coined in 1980 by Alvin Toffler, an American futurist.

[24] Napolitano, Clara, and Alessandro Gorgoni. *Energy As A Common: New Paths Of Production. The Key-Role Of Energy Communities In The Italian Context*. Ius Publicum 2: 1-38. 2023.

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1.3.2 Typologies of energy communities

Energy communities are not uniform entities; rather, they represent a spectrum of socio-technical arrangements shaped by diverse territorial, economic, and cultural conditions. While legal and technical classifications, such as those distinguishing Renewable Energy Communities (RECs) from Citizen Energy Communities (CECs), provide a structural foundation, a comprehensive understanding of energy communities requires consideration of the societal, economic, and governance dimensions that underpin their development and operation[25].

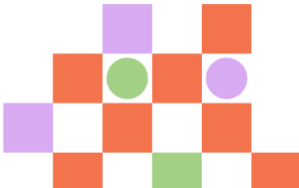
One primary axis of differentiation concerns the emergence of the initiative. Energy communities may originate through bottom-up, citizen-led processes, or they may emerge from top-down interventions initiated by municipalities, utilities, or regional governments. Hybrid forms are also common, where civic engagement intersects with institutional facilitation. The motivations driving their creation, ranging from energy autonomy, climate action, and social solidarity to economic resilience and innovation, deeply shape their structure and internal dynamics.

The governance architecture of energy communities varies widely. Legal forms such as cooperatives, non-profit associations, foundations, or special-purpose vehicles condition the rules of participation, decision-making, and benefit distribution. However, the presence of a legal form is not in itself indicative of democratic governance: some energy communities may retain participatory mechanisms and transparent decision-making processes, while others may be driven by a small group of initiators or investors. Degrees of institutional stability, financial maturity, and capacity for inclusive governance strongly affect the sustainability and replicability of the community.

Further differentiation arises from socio-economic and spatial conditions. Energy communities embedded in long-standing community networks often benefit from a high degree of mutual trust and cohesion, facilitating collective decision-making. In contrast, initiatives in areas marked by socio-economic vulnerability, population turnover, or infrastructural marginality may struggle with fragmentation, representation, and long-term engagement. Variables such as energy literacy, previous civic experience, and demographic diversity also shape the inclusivity and resilience of the initiative.

Environmental and digital dimensions provide another layer of analysis. The territorial context like rural, urban, or peri-urban, determines not only the availability of renewable resources but also the socio-political interfaces with local governance, land use, and planning systems. In parallel, digital technologies play a growing role in enabling participation, energy monitoring, and peer-to-peer exchanges. However, digitalization

[25] This typological subdivision is informed by Eutropian's internal database and built upon prior applied research and field experience.



also risks reproducing exclusion among populations lacking access to connectivity or digital skills.

Lastly, energy communities differ in the narratives and identities they construct. Some communities are grounded in shared memory, cultural heritage, or place-based identity, while others coalesce around emergent values of climate responsibility, solidarity, or economic innovation. These symbolic dimensions influence not only internal legitimacy and engagement but also how communities interact with external institutions, seek funding, and position themselves within broader energy transitions.

In sum, typologies of energy communities must move beyond legal or technological variables to capture the interplay between institutional, socio-economic, spatial, and symbolic factors. A multidimensional and contextual approach is essential to understand their dynamics and to design responsive regulatory and support frameworks.

1.4 The social and cultural genesis of the energy communities. Typology of emergence

It is interesting to examine the conditions under which cultural and social communities (those formed around shared practices, values, and territorial belonging) can effectively evolve into legally recognized energy communities within the current European and national legal architectures. This investigation stems from the recognition that many such communities already possess key attributes of collective action, including high levels of trust, participatory governance, and embedded local knowledge, which are also essential features of successful energy communities. The research therefore posits that these pre-existing communities can represent fertile ground for the development of energy communities, provided that enabling legal and institutional frameworks are in place.

Energy communities that emerge from social and cultural networks bring distinct added values to the energy transition. By growing out of communities of people (rather than being imposed), they create benefits that extend well beyond the kilowatt-hours produced. Some key advantages include:

- Enhanced Public Acceptance and Support: When people collectively own or govern a project, they are far more likely to support it, and even become advocates for it. Local opposition to renewable installations (the “not-in-my-backyard” syndrome) is markedly reduced when projects are seen as *“our project”* rather than an outside development.
- Social Capital and Cohesion: Energy communities inherently build social capital: the networks, trust, and norms that enable collective action. Working together on an energy project strengthens relationships among participants and can revive

local democratic engagement. Participants develop a shared sense of purpose and pride, which reinforces community cohesion.

- Empowerment and Energy Democracy: A core promise of bottom-up energy communities is empowering citizens in the energy system. Rather than being passive consumers subject to utility bills and distant decisions, people in energy communities become active "prosumers" and decision-makers. This democratization of energy – often referred to as *energy democracy* – gives individuals and communities a direct say in how their energy is produced and used. It can also promote energy justice, by prioritizing inclusive benefits and fair access. By prioritizing social goals and collective governance, community energy initiatives strive to ensure that the clean energy transition is not only fast, but fair.
- Local Economic Benefits and Development: When energy projects are rooted in the community, the economic returns stay local. Profits from selling renewable power are recycled into the community or shared among local member-owners, rather than flowing to distant shareholders. This can mean lower energy bills for members and funds for community purposes. Community energy can also create local jobs and skills: for instance, hiring local contractors for installation and maintenance, or even training residents in renewable energy technologies.
- Resilience and Self-Sufficiency: Finally, energy communities can enhance resilience, both infrastructural and social. On the social side, the act of organizing increases a community's capacity to face challenges together. A network of people who have successfully run a solar cooperative, for example, is better positioned to coordinate disaster response or adapt to economic shocks. Culturally, knowing that *"we can solve our own energy needs"* strengthens community confidence. This resilience aspect is increasingly valued in an era of climate instability and market volatility. It ties back to the cultural genesis: many communities have historical memories of hardship or exclusion that motivate them to seek greater self-reliance through collective energy action.

The bottom-up, culturally grounded nature of energy communities yields multiple co-benefits. These initiatives do more than decarbonize the energy supply, they engage and uplift communities, aligning technological change with social progress. By rooting projects in local social structures, energy communities ensure that the transition to renewable energy also reinforces community bonds, local cultures, and democratic values. This synergy of social and technical transformation is the added value that top-down projects often lack. It means energy communities can be powerful agents of change, modeling a future energy system that is not only sustainable, but also inclusive, community-centered, and just.

Energy communities can be seen as a form of social innovation in the energy transition, a way in which society itself (through networks, norms, and collective action) innovates

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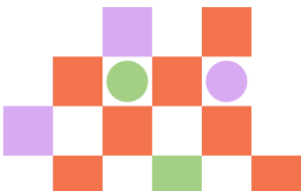

to achieve sustainability. They exemplify concepts of energy democracy and grassroots innovation by placing ordinary people at the center of transformation. Practically, recognizing the typology of their emergence can guide policymakers and practitioners: for instance, leveraging existing social and cultural community groups or cooperative traditions can jump-start new energy communities, while policies should provide enabling frameworks (legal, financial) that still leave room for genuine local initiative

2. State of art and existing good practices

A number of pioneering initiatives have already demonstrated the feasibility, scalability, and transformative potential of socially and culturally rooted energy communities. These examples serve not only as proof of concept but also as laboratories of innovation, showing how culturally-driven approaches can align technical ambition with social inclusion and democratic governance. This section presents three exemplary cases that reflect the principles discussed in the preceding theoretical analysis, initiatives that have successfully combined collective ownership, strong local identity, and bottom-up engagement to deliver both energy and societal benefits. By examining these cases, it is possible to gain concrete insight into how values of trust, participation, and place-based belonging are translated into operational models that inform the future direction of energy community development.

2.1 Kazán Energy Community, Budapest (Hungary)

Located in the culturally diverse and historically working-class eighth district of Budapest, the Kazán Energy Community exemplifies how solidarity-based urban collectives can evolve into pioneering energy communities rooted in local identity, shared ownership, and democratic governance. Hosted within the Gólya Cooperative and Kazán Community Centre, it is one of the most developed single-building energy communities in Hungary. Kazán demonstrates how a cultural and social hub can serve not only as an incubator for civic engagement and political discourse, but also as a functional platform for energy transition, even in a restrictive national regulatory context.

The story of Kazán begins with the relocation of the Gólya Cooperative, which operated a well-known cooperative social and cultural hub with a community oriented bar and music scene in central Budapest. Facing rising rents and the pressures of gentrification, the cooperative sought greater security and autonomy. In 2019, together with allied social

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organizations, Gólya acquired an abandoned industrial building in the 8th district, setting the foundation of what would become Kazán. This move reflected more than a change of address: it embodied a strategic and ideological commitment to cooperative ownership and space as a commons. The decision to purchase and collectively manage the building was rooted in the belief, championed by the Alliance for Collaborative Real Estate Development (ACRED), that access to urban space should be determined by need, not market speculation. This commitment to anti-gentrification, affordability, and social autonomy gave rise to a thriving cultural center, now home to a wide range of community-oriented organizations: a bar, radio station, critical pedagogy initiative, political research workshop, and social enterprise. These groups form the social backbone of Kazán, united by a shared ethos of inclusion, mutual support, and democratic practice. Energy emerged organically from this environment as both a practical necessity and a natural extension of their communal ethos.

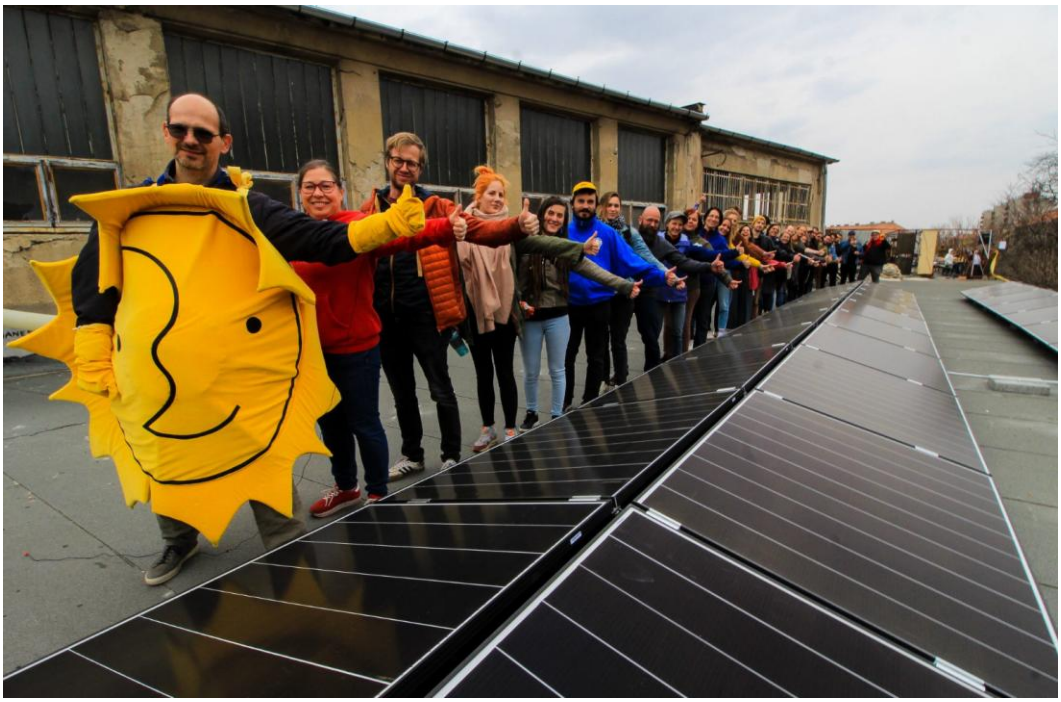

Figure 2: Members of the Kazán Community Centre on top of their roof celebrating their new solar panels. Photo (c) Kazán Community Centre

2.1.1 Emergence of energy community

Prior to forming the energy community, members had limited familiarity with energy systems, a condition common in Hungary due to longstanding state-subsidized household tariffs or *rezsicsökkentés*. However, for Kazán's collective, which pays full market energy rates as the state does not subsidise institutions or cooperative energy costs, the 2020–2022 price shocks were a turning point. The imperative to achieve energy security led to

the installation of a photovoltaic system (PV), funded by a state grant. The process, spanning nearly two years due to administrative delays, became a valuable collective learning experience, deepening members' understanding of energy autonomy.

Parallel to the PV rollout, Kazán launched a Community Energy Fund, financed by revenues from renewable generation. Managed democratically, the fund targets building improvements such as insulation, smart metering, and heating system upgrades. The fund also acts as a solidarity reserve, supporting member organizations unable to meet energy costs. Through this model, Kazán links environmental sustainability with direct social protection, institutionalizing energy justice and solidarity at the building level.

2.1.2 Governance and organizational structure

Kazán's energy governance is anchored in a cooperative, community-based decision-making structure that integrates energy management into the broader administration of the building. All tenant organizations participate in bi-monthly plenary assemblies, where strategic decisions, including the allocation of energy fund revenues, are made collectively. Technical operations and energy proposals are prepared by a management group, primarily composed of ACRED members and others with relevant expertise, but all key decisions are subject to deliberation and consensus within the plenary.

This dual structure ensures that technical competency and democratic legitimacy co-exist. It embeds the energy system within a larger culture of transparency, inclusivity, and self-governance, reinforcing the community's ability to steer its own energy future.

2.1.3 Legal and financial innovation

Hungary currently lacks a comprehensive enabling framework for energy communities, and legislation does not support electricity sharing beyond single buildings. Within this restrictive context, Kazán exemplifies how social and cultural hubs can become energy communities through legal ingenuity and organizational resilience. By operating as a cooperative with clear legal identity and a shared infrastructure, Kazán exercises de facto energy community functions even in the absence of formal recognition under EU definitions.

Financially, the Community Energy Fund substitutes for unavailable state incentives and introduces a redistributive logic, turning energy savings into community capital. This self-financing model not only funds sustainability upgrades but also supports precariously funded NGOs that serve vulnerable populations, including youth and Roma communities. Thus, energy becomes a vehicle for welfare provisioning, not just technical optimization.

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2.1.4 Social value and empowerment

The added value of Kazán's bottom-up character is evident in its high engagement levels, trust-based governance, and integrative social functions. Energy is not merely consumed, it is collectively produced, managed, and politicized. The community's smart heating system has not only improved comfort and reduced gas consumption, but also increased energy literacy and behavior change among members. Meanwhile, the cooperative structure fosters horizontal accountability and ensures that energy decisions reflect broader social priorities.

Most importantly, Kazán's efforts sustain a network of organizations working with and for marginalized groups, indirectly multiplies the social impact of its energy innovations. In this way, Kazán embodies the idea of energy as commons, where sustainability is inseparable from democratic management and cultural belonging.

2.2 Quarticciolo Energy Community, Rome (Italy)

Quarticciolo is a social housing neighborhood in the eastern periphery of Rome, originally developed in the 1940s as a *borgata* (peripheral settlement) under Italy's Fascist regime. It was one of the last of Rome's planned *borgate* (neighborhoods), intended to relocate low-income populations away from the city center. Today, Quarticciolo is home to roughly 6,000 residents, many of whom live in poverty or precarity amid decaying public housing blocks. Socio-economic challenges are acute: the area suffers from high unemployment and underemployment, low income levels, and episodes of crime and drug activity. Physical conditions in the aging apartment blocks are poor; incidents of structural disrepair (even building collapses) have been reported, reflecting long-deferred maintenance. The neighborhood's dense concentration of public housing and limited formal services have contributed to Quarticciolo being characterized as *vulnerabilità estrema* (extreme vulnerability) in the urban context.Quarticciolo faces the intertwined problems of spatial marginalization and social disadvantage common to many post-war peripheral estates: physical decay, economic hardship, and a sense of institutional abandonment.

Yet, despite and paradoxically perhaps because of these hardships, Quarticciolo has developed a strong local identity and solidarity culture rooted in its history of resistance and social struggles. The community's collective memory of having "won" basic services through protest (e.g. obtaining schools, a tram line, etc., in past decades) lives on in a combative civic spirit. This context has set the stage for remarkable bottom-up initiatives

in recent years, as residents and local actors refuse to accept the “destiny of an enclave” and instead organize to improve their neighborhood from within.

2.2.1 Community Fabric as Foundation for an Energy Community

Quarticciolo’s dense network of grassroots organizations and its legacy of solidarity have created fertile ground for the emergence of an energy community. In Italy, successful energy communities typically require a strong base of social cohesion and trust. Quarticciolo exemplifies how a community’s cultural and civic fabric can pave the way for collective action on energy. The neighborhood’s experience of social marginalization and housing instabilities has shepherded a strong sense of solidarity and social identity. Activities such as a community brewery and boxing gym are deeply embedded in local tradition, and have helped build a *resilient, tight-knit community* prepared to undertake cooperative initiatives. This human factor distinguishes Quarticciolo’s approach: the energy community is seen not as a narrow technical venture but as a social project rooted in the neighborhood’s values of mutual support. For example, the initiative is organized around the existing community hub of the boxing gym, leveraging the space and its social reach to engage residents in energy issues. The goal is not only to install solar panels, but to “create a resilient network to tackle energy poverty” by providing affordable sustainable energy to residents through collective action.

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Figure 3: Community gym in the social housing neighbourhood of Quarticciolo, fighting energy poverty through community energy. Photo (cc) Eutropian, Palestra Popolare

2.2.2 Emergence of energy community

The energy community in Quarticciolo has emerged as a natural extension of the neighborhood's long-standing tradition of self-organization, mutual aid, and cultural solidarity. Building on years of grassroots activity, from the transformation of abandoned spaces into community gyms and cultural hubs, to the creation of local food markets and educational initiatives, residents have cultivated the social trust and organizational capacity needed to initiate a collective energy project. The decision to form an energy community was driven by both practical concerns, such as rising energy costs and deteriorating building infrastructure, and by deeper commitments to autonomy, social justice, and environmental sustainability. Rather than being an externally imposed initiative, the energy community arose from within the neighborhood's existing civic ecosystem, where participatory governance, shared values, and collective ownership were already embedded. This made it possible to conceptualize energy not as a technical commodity, but as a shared resource to be managed cooperatively for the benefit of residents, especially those most affected by energy poverty. The initiative reflects a broader vision of regeneration in Quarticciolo: one where the energy transition is intertwined with social inclusion and local empowerment.

As of late 2024, the Quarticciolo energy community was in an advanced development phase but not yet generating power. The association has been formally established, and community outreach is ongoing,(including energy literacy workshops and assemblies to involve more residents. The principal hurdle remaining is financing the upfront cost of the PV installation. The community has been exploring multiple avenues: applying for public grants, seeking private sponsorships or CSR contributions, and crowd-funding. By late 2023, an association to run the energy community had been set up and was actively searching for the necessary finances to install the solar panels on the gym's roof.

2.2.3 Governance and organizational structure

The governance and organizational structure of the Quarticciolo energy community reflects the neighborhood's strong commitment to democratic participation and collective decision-making. The community has established a dedicated non-profit association to serve as the formal legal entity overseeing the energy project. This association brings together representatives from local resident groups, grassroots organizations, and active civic spaces, such as the community gym, neighborhood assemblies, and cultural collectives, all of which have played central roles in the area's social regeneration. Governance is based on inclusive and transparent processes: regular assemblies are

held to deliberate on decisions such as energy use priorities, benefit distribution, and reinvestment strategies. A coordinating group with relevant technical and organizational experience prepares proposals and ensures operational continuity, while all final decisions are made collectively in plenary sessions. This structure ensures that the energy community is not only technically functional but also socially anchored, managed by and for the neighborhood, in alignment with its values of solidarity, care, and mutual support.

Local governance of the energy community has been established through a newly formed nonprofit association, often referred to as the *Polo Civico Quarticciolo*. This association was constituted in 2022 to serve as the legal entity of the energy community. It brings together neighborhood stakeholders, including tenant representatives, members of the Palestra Popolare, the Quarticciolo tenants' committee, and other civic groups, in a democratic structure to manage the community energy project.

2.2.4 Legal and financial innovation

The Quarticciolo energy community represents a distinctive case of legal and financial innovation grounded in grassroots practice. Operating in a context where public housing governance is often opaque and restrictive, the community has taken proactive steps to establish a nonprofit legal entity capable of managing collective energy assets and navigating regulatory frameworks. This structure enables the community to act with legal personality, essential for contracting services, managing shared revenues, and formalizing participation in energy sharing mechanisms. Financially, the community has developed an internal model based on reinvestment and solidarity: projected revenues from the shared use and sale of renewable energy are earmarked for neighborhood improvements and social support, such as maintaining public spaces or assisting vulnerable households with energy costs. Importantly, this model builds upon an existing base of local economic activity. Over recent years, Quarticciolo has cultivated several community-run enterprises, including a cooperative brewery, a food market, and a community kitchen, which have not only fostered skills and employment, but also demonstrated the viability of local solidarity-based economies. These pre-existing ventures offer practical experience in managing shared resources and create a supportive infrastructure for energy-related entrepreneurship, such as training programs and cooperative service models. By integrating energy production into this wider ecosystem, the community is pioneering a socially rooted economic model that merges environmental transition with urban regeneration.

2.2.5 Social value and empowerment

The Quarticciolo energy community embodies a broader vision of empowerment rooted in the neighborhood's culture of resistance, solidarity, and mutual care. Its value extends well beyond the generation of renewable energy: it reinforces community bonds, fosters a shared sense of ownership, and enhances the everyday lives of residents. By involving local actors in every phase, from planning to governance, the project strengthens participatory democracy and deepens civic engagement in a context where institutional neglect has long eroded public trust. Residents who have historically been excluded from decision-making processes are now central to shaping the future of their neighborhood. The initiative also contributes to social inclusion by directly addressing energy poverty and enabling vulnerable households to benefit from clean, affordable power. At the same time, it nurtures local capacities: through assemblies, training, and collective problem-solving, community members gain knowledge, confidence, and new competencies. In a district where public services are limited and economic opportunities scarce, the energy community becomes a platform for dignity, agency, and cohesion, proving that energy transition, when grounded in local needs and values, can become a powerful tool for social transformation.

2.3 Glanskern Benthuizen (The Netherlands)

Benthuizen is one of the villages of the municipality of Dutch city Alphen aan den Rijn. Counting more than 3.600 residents, the village is one of the smallest in the area. The village and its people once played an important role in the harvesting of peat. The intensive extraction of peat led to a drastic change in the landscape and eventually to a decline of the number of residents. Some smaller villages surrounding Benthuizen were even depopulated. During the reclamation of the land (in Dutch: inpolderen), the large bodies of water were transformed into land. Since most of this newly reclaimed land was agricultural it provided the conditions for the village to grow again.

Benthuizen is located in the middle of the Green Heart (one of the biggest green areas in the Randstad). The population of the village has grown steadily since the 1960's because of new developments. More than half of all the homes in the village were built after 1975, and almost 86% of all houses are ground-level homes. Because many houses were built more recently most of them have reasonably well energy labels. Less than 25% of the houses have an urgency to become more sustainable. Benthuizen is pretty well on the way when it comes to the national ambitions.

Social-economically, Benthuizen is a middle income community, with an average economical value per house of around € 415.000. More than half of the village population has completed a middle to higher education.

Even though hardships in Benthuizen seem to be less common, there is a growing group of residents collectively working on a fair energy transition. Sometimes, it's in the smallest of communities where the motivation for transition is biggest.

Figure 4: Community and social activities of Benthuizen. Photo (cc) website of the community: energiekalphenaandenrijn.nl.

2.3.1 Community Fabric as Foundation for the Energy Community

The social fabric in Benthuizen can be characterized as close-knit. Social organizations in the village are active in the organization of a range of social events, which lead to a strong social structure and involvement of residents. Residents provide support and care to others within the community. The church communities play an important role in this. The village council provides a platform for continuous deliberation on the state of the village.

Benthuizen has several community places, among which is a multifunctional accommodation that serves as a neighborhood meeting place where many social events take place.

2.3.2 Emergence of energy community

Benthuizen has a history when it comes to energy. Starting in the mid of 16th century, an important fuel for homes and industry was burning peat. The Netherlands was rich in peat fields and Benthuizen was among one of these fields. In the 18th and 19th century, cutting peat was an important economic activity, and until the 19th century peat was an energy source. With the emergence of coal and natural gas the role of many small communities has changed. Also, in Benthuizen.

Just as centuries ago, today the community contributes to the energy transition in important ways. As part of the close-knit community in the village (and broader municipality of Alphen aan den Rijn) an energy community emerged in 2019 called *Energiek Alphen aan den Rijn*. Their wish: becoming energy neutral as community and municipality. They want to achieve this by producing renewable energy with and for the community. Their ambitions include (1) more awareness, (2) saving costs, (3) producing and sharing renewable energy, (4) less dependency on commercial energy producers (and therefore, less susceptibility of price fluctuations on the energy market), (5) supporting and growing local entrepreneurship, and (6) supporting innovation and education, i.e. by training local craftsmen and energy experts.

Glanskern Benthuizen is a pilot project of the energy cooperation, supported by Local4Local. The intention is to create an almost closed circuit of producing and sharing renewable energy. The pilot officially started in 2025 with 7 participants, ranging from residents, a business owner, a supermarkt, a church and the sportscanteen of the local football club.

2.3.3 Governance and organizational structure

The energy cooperation *Energiek Alphen aan den Rijn* consists of 150 members (in 2024). Many of these members are voluntarily providing services for other members, such as giving individual energy advice. In the past six years they provided more than 1800 of these energy advices. The cooperation also constructed to solar roofs (totalling of 2.266 solar panels producing on average 550.000 kWh of energy each year; enough for over 200 households). Members investing in these solar roofs earn their investment back in seven years.

Being a cooperation, the organization has a board of members that organizes members assemblies (at least once a year). Because the energy cooperation has members spread over the different villages within the municipality, additional meetings are organised to share stories and insights and work on more cooperation. An example of this, is the

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Samen Slimmer Verduurzamen meeting. Invited were members (volunteers and administrators) of many different village organizations (such as community centers) that stand up for the interest of residents in the villages and neighborhoods.

The cooperation has become the platform for community members to work on projects within the different villages and neighborhoods and to discuss outcomes and possibilities for future projects. *Glanskern Benthuizen* is one of these projects. The project has a core team consisting of project leaders from *Energiek Alphen* and energy coaches from the Benthuizen community. This core team has regular meetings and has a strong link with the community.

2.3.4 Legal and financial innovation

The name *Glanskern* comes from the combination of the words *gemeenschap* (community) and *balans* (balance). It relates to the mission to find a balance between the production and sharing of energy among community members. The concept is clear: produce renewable energy and distribute the production directly to community members. Energy that is produced but can't be used directly is stored in a neighborhood battery. Production comes from solar panels and wind energy.

The start of the project in 2025 was small, with only 7 participants. Only one of these members has a connection to the national energy grid. In periods when too little or too energy is produced it can be traded on the grid.

The legal innovation lies in the nearly full autonomy of the community in the production and sharing of energy. The first results show that a direct match can be made for over 80% of the produced energy (this is self sufficiency, that includes the stored energy in the neighborhood battery). This works so well because of the different user profiles (residents, but also business owners and community meeting places). Glanskern Benthuizen creates a hopeful perspective for future efforts of direct sharing and a financially inclusive energy transition. In 2026 the pilot will be expanded

2.3.5 Social value and empowerment

Glanskern Benthuizen takes a leading role in the energy transition, showing it's not (just) about the individual efforts of home-owners and renters. Only a collective effort, a community effort, creates a sustainable organizational, financial and social model for the energy transition.

With the ambition to have a low price for the produced energy that's fixed for a longer period of time, renewable energy becomes available for everyone. The energy

community *Energiek Alphen aan den Rijn* shows that the energy transition only works if everyone can join.

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